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Electrical World

McGraw-Hill Company, Inc. *August 22, 1925* Twenty-five Cents Per Copy

The Inside Story~

This is the main bay of the Elpeco works in Philadelphia

—an outstanding example of specialization in

HIGH TENSION EQUIPMENT

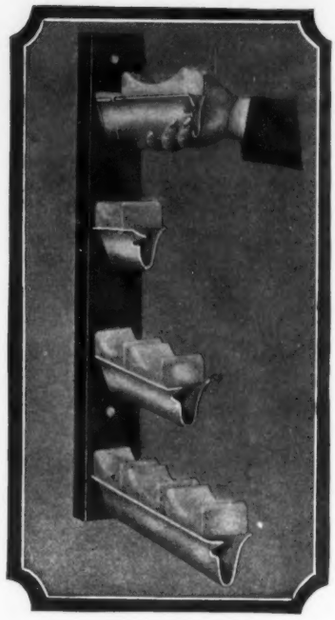
—for use on systems of 2300 volts to 220,000 volts

for the good of the Service

ELPEC

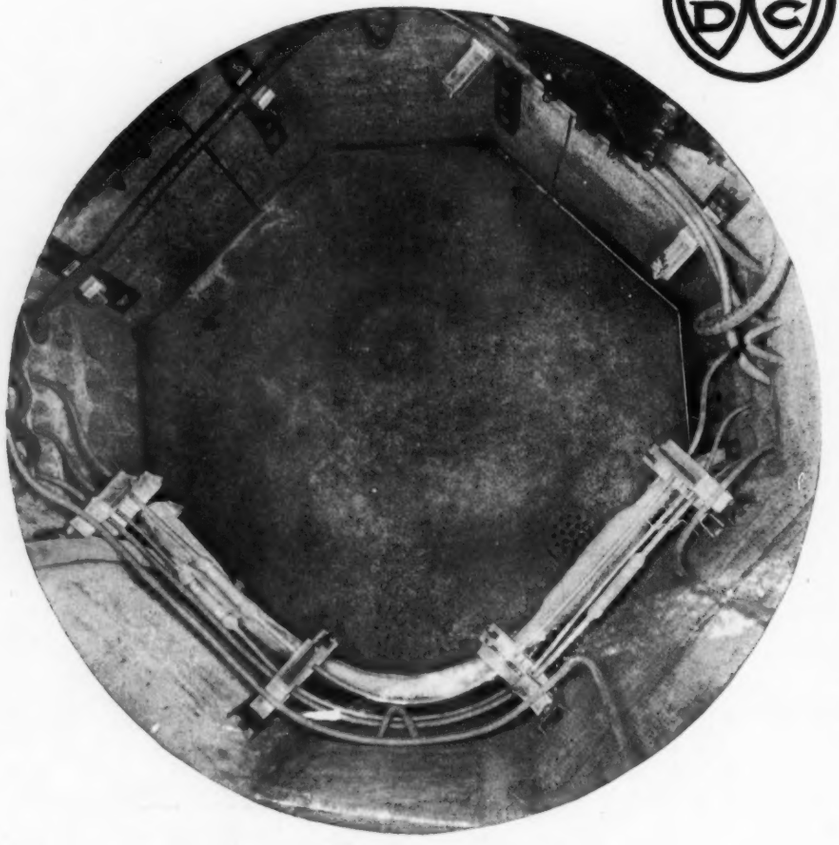
PHILADELPHIA

for better protection—
Metropolitan Subway Cable Racks



In case of serious burnouts on power cables the trouble on one cable often travels via hanger or defective cable and stanchion to those supporting the adjoining cable.

In the Metropolitan rack the porcelain insulator interposes a heavy insulation to the spread of this kind of trouble.



Manhole Installation—Ohio Power Co.

It is not necessary that cables be placed in a set or fixed position from racking wall of a manhole.

The grooved hanger arm allows the porcelain insulator to move with the cable to any position during expansion and contraction.

To change size of arms is a simple matter — just raise arm out of notches and insert the one required.

Booklet showing numerous installations sent on request.

METROPOLITAN DEVICE CORPORATION

1250 Atlantic Avenue, BROOKLYN, N. Y.

Electrical World

Published by McGraw-Hill Company, Inc
W. H. ONKEN, JR.
Editor

VOLUME 86 — *New York, Saturday, August 22, 1925* — NUMBER 8

A National Public Relations Program for the Industry

THROUGH its member companies, the National Electric Light Association will place in the hands of millions of users of electricity a monthly message dealing in a popular and readable way with some of the outstanding accomplishments and problems of the industry. In addition, the stockholders of electric light and power companies will receive quarterly a separate message of particular significance to the investor. By this means it is hoped to correct many misconceptions regarding electric public utilities and by simple statement of fact to fortify the public mind against the intrigues of the demagogue and slanderer of public service corporations.

While more than five million sets of messages have already been ordered, the program to be effective and truly national in scope should receive the unqualified support of the entire power industry. The messages are commendable and worthy of the widest distribution. They are short, crisp, picturesque and informative. Besides, they embody a national policy, far-reaching and broad, and as important to the consuming public as it is to the electric utility companies. Much time and thought have been given to the preparation of the text, and every executive owes it to his company as well as to the electrical industry to see that the program as mapped out by the Public Relations Section of the National Electric Light Association "goes over" 100 per cent.

Public Utility Market Situation Demands Caution

EVERY ONE in the utility industry has been glad to observe the enviable standing which the securities of electric utility companies have attained in the last few years. Part of the increase in the prices of utility stock is justified because of the better understanding of utilities and their stability. However, radical price increases serve to create an impression that unwarranted profits are being made by operating companies, when they are not, and violent fluctuations in stock prices imply that utility earnings are unstable, when quite the reverse is true.

Fortunately the securities in which the general public ordinarily invest have not been subject to speculative price changes. On the other hand, the common stock, which is quoted in newspapers and subject to public gaze, has undergone extreme and erratic changes, and while quotations thereon are not directly under the control of utilities, holding companies particularly, and operating companies to a limited extent, can minimize speculation by educating the public to weigh both the limited returns available under commission regulation and the stability of return due to the diversified and essential nature of the business as well as to regulation. Now, speculation has been stimulated more or less by the manner in which financial statements have been presented, and for this the companies themselves are to blame. Among the practices which lead to misinterpretation are the capitalization of present earnings of newly acquired properties without giving full consideration to the large capital expenditures necessary before these new properties can be considered seasoned, integral parts of the holding company system. While a conservative management may withhold distribution of surplus from subsidiaries until full consideration of future requirements can be given, an overambitious management may prefer to show large net earnings by distributing undivided profits in the form of dividends or increased capitalization. With a return to a normal rate of territorial expansion the overextended company may find itself faced with normal earnings and abnormal capital liabilities, and the shock of the inevitable readjustment of earnings to capitalization may react harmfully to the prestige of sound as well as speculative securities.

The Passing of Sir Adam Beck

THE outstanding figure in Canadian power circles has been called by death. Although not unexpected, the demise of Sir Adam Beck came as a shock, the more so since the difficulty of filling his place at once rose to the mind. Men of his type of executive ability are never plentiful, and fewer still are endowed with the gifts of personality, political astuteness and popular appeal which were peculiarly his. Unheard of in Canadian electrical circles a generation ago, he rose to international fame in a remarkably short time, indicating the opportunities which every new country affords to those able to grasp them.

Having acquired a competency as a manufacturer of boxes, Sir Adam at an age when most men think of ease and comfort turned his thoughts to provincial issues. Electricity was then in very general use on the American side of the Niagara frontier but did not enjoy wide application in Ontario. As a manufacturer Sir Adam knew the value of power to industry, and he sensed the advantages of electricity in the home and in the marketplace. The more he pondered over the problem, the greater loomed the possibilities until at length he espoused the cause of electrical development and proposed a hydro-electric commission to transmit electricity from Niagara Falls to the various municipalities in eastern Ontario. Opposition naturally developed, but the larger it grew the more resolute he became. He visioned a province-wide superpower system transcending in size and importance anything at that time existent in Ontario, and it was not long before municipal authorities and the general public rallied around his banner. When the Hydro-

Electric Power Commission of Ontario became a reality, Sir Adam Beck was appointed its chairman, and thereafter he made government ownership of electricity his mission and consecrated himself to its fulfillment.

Up to the time of his death Sir Adam remained the guiding genius of the Hydro-Electric Power Commission of Ontario. During the twenty years of his incumbency he was oftentimes a storm center around whom waged many a heated controversy. "Dictator" and "tyrant" his opponents called him; yet, without adverting to the conditions under which Sir Adam worked his will, it can be said that throughout all his career he showed great resourcefulness, and to his dying day he retained the confidence and admiration of the people of the province. He popularized and increased the use of electricity in Ontario and created one of the greatest superpower systems in the world. Whether or not his work will endure time alone can tell. He was stricken in the height of his power, and it remains to be seen how Ontario's Hydro system will get along now that its master mind is dead.

It has been suggested that had the Mackenzie-Mann interests been less arrogant and the electric utilities been more aggressive, Ontario would be just as conspicuous a bulwark of private initiative and enterprise as is the United States. However, there is no reason why the sentiments of Ontario and the United States should be in complete accord on this subject. The forms of government differ, and the powers which Sir Adam Beck enjoyed and by means of which he built up the Hydro system would never be accorded to any individual in the United States in times of peace. During the war we were beguiled into a mild form of government ownership and operation and it has sufficed us. We are still paying the price for one of the greatest economic blunders of which a democratic people were ever the victim. In the United States we believe and have proved to our satisfaction that the salvation of democracy lies in individual initiative and enterprise. Ontario chooses a system more feudal than democratic, and while we think none the less of her for it, we do not covet her form of government or her Hydro system, however excellent both may be. We do not say this in disparagement, but to indicate why a system like that built up by Sir Adam Beck and which is satisfactory to the people of Ontario may not find a lodgment in the United States. Electrically, the United States leads the world, chiefly because its people cherish democratic principles and offer every inducement to individual enterprise.

Data Pertaining to Watts per Square Foot in Residence Lighting

IN PREVIOUS editorial comments the ELECTRICAL WORLD has pointed out that lighting recipes for certain rooms in the home could not practicably be based upon watts per square foot, but, on the other hand, that watts per square foot might be utilized as a rough measure of the level of lighting or of connected load. Since then averages of floor areas of the principal rooms in a large number of homes ranging from six to eight rooms have been obtained. From recent surveys the average total wattages of incandescent lamps now existing in the various rooms of the home are known, and there are also recommendations available for adequate and convenient utilitarian lighting.

Based upon the average sizes of the various rooms, the wattage per square foot in these rooms at present and as it would be if the recommendations for utilitarian lighting were carried out are respectively as follows: Living room, 0.95 and 2.00; dining room, 0.90 and 1.32; kitchen, 0.75 and 1.70; bedroom, 0.70 and 1.27; bathroom, 1.34 and 1.90. The averages for these rooms, including the two and one-half bedrooms in the average home, are 0.85 watt per square foot at present and 1.56 watt per square foot recommended for adequate and convenient utilitarian lighting. In other words, exclusive of halls, closets, attic, basement and porches, the average watts per square foot should be 1.56. The total floor area of the six and one-half rooms per home averaged 988 square feet for the group of homes studied.

Including the total floor area, exclusive of basement, attic and porches, it seems safe to assume that a grand average of 1.5 watts per square foot should be aimed at for satisfactory utilitarian lighting. Of course, the wattage must be in the proper lighting equipment, which also must be properly located. This is where actual specifications must be depended upon rather than merely watts per square foot. Decorative lighting is not included, but obviously this can greatly increase the ultimate watts per square foot. A revision upward may be considered after satisfactory utilitarian lighting is achieved. In the meantime lighting interests will do well to aim at a grand average of 1.5 watts per square foot in home lighting, distributed more or less as just indicated in the various rooms.

The Only Way to Make the Electrical Dealer Prosper

RETAIL electrical appliance dealers as a class are not prospering. As a result of very extensive observation and inquiry it may be said that there are almost no electrical dealers in the country who are making money unless their appliance merchandising is combined with contracting or fixture sales or some other associated business that provides a profitable volume and carries the load of overhead. In such a combined enterprise, however, appliances provide a fill-in business that adds to the earnings.

There is a very clear and simple reason why the dealer does not prosper under existing conditions. There is not enough volume of sales today in the average community to give the electrical appliance merchant sufficient turnover to enable him to make a living at the prevailing margin of profit on the line. And this condition will probably continue until the popularity of electrical appliances in the home has increased to a point where there is business enough to make it pay. Meanwhile the dealer very naturally will have to be conservative in the amount he spends in either advertising or selling.

Is the central-station industry content to let the rate of progress in the appliance equipment of the American home wait upon this retarded evolution? The idea that merchandising activity on the part of the electric power company is hurtful competition with the dealer has been proved a fallacy in many cities. For what the dealer needs is volume of sales—the volume that will come only when complete electrical appliance equipment is established as the standard of the modern home and every customer is spending on household purchases of

electrical merchandise, not six or ten dollars a year, but fifty dollars. When the electrical dealer can look to each customer for the year-in-year-out trade that a hardware dealer counts on from the same household, then he will have a going business that will prosper.

The quickest way to bring this about is for the central-station company to do an energetic job of merchandising and build up the popularity of electrical appliances for comfort, convenience and labor saving in the home. If its selling policies are economically right, this will not hurt the dealer. It will help him.

The Hurley Prize Holds Out Fresh Hope to Merchandising Men

A GIFT of ten thousand dollars in cash by Edward N. Hurley as a prize to encourage improvement in central-station merchandising methods was announced at the recent N. E. L. A. convention in San Francisco. Mr. Hurley asked the Commercial Section to conduct a contest and award this tempting purse to that electric power company whose commercial organization has done most to perfect and point the way to better retail selling practice in the domestic appliance field. This money will be distributed by the winning company among those of its employees who have contributed to the achievement.

Merchandising is fast becoming recognized among central-station executives as one of the fundamental functions in the conduct of the business of the modern light and power company. It is taking its place as an executive responsibility of major prominence. But proficiency cannot be acquired over night. Merchandising is not an exact science. It is an art based on human psychology. This art is a product of human ingenuity and experience that have evolved through ages of barter and trade. Spirit, imagination, confidence, enthusiasm, personality are all elements in the art of selling that cannot be absorbed out of a textbook. Yet there are natural laws that govern cause and effect in selling no less than in the field of engineering. These laws must be learned and understood. No man can enter lightly into merchandising, trusting to luck and snap judgment, and expect to make much headway against the mature competition of the other merchants in the local market who are also competing for the attention and the appropriations of the same households to which the central station must make its appeal.

The reason many of the electric power companies have been backward in commercial policy and in merchandising practice is simple. The executives of these utilities are most of them technical and professional men. They have not studied this art of selling. They have not learned by experience the laws of trade. Therefore they have not given the attention and support to the organization of this branch of their business and the training of its representatives that is essential to any really large measure of success in retail merchandising.

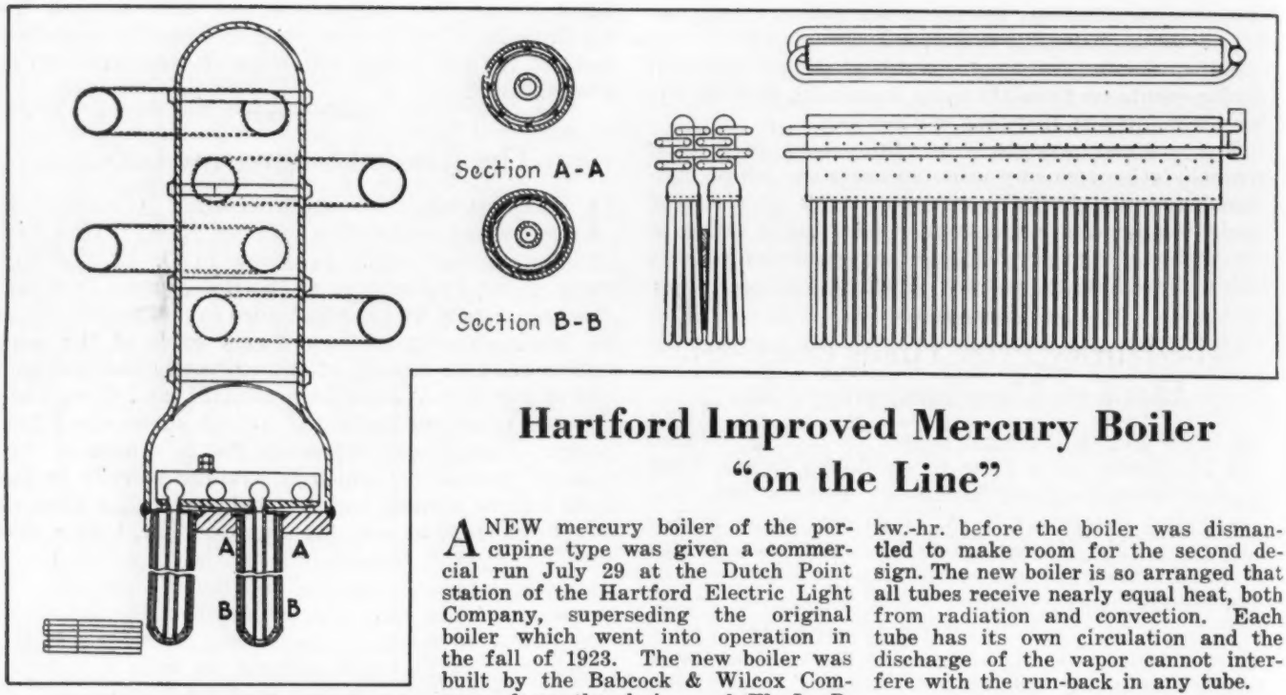
Mr. Hurley's generous prize will be extremely helpful because it will cause many central-station executives who have not given the matter deep consideration before to think seriously about merchandising methods and policies. It will encourage many company sales managers who are already skilled in the art to fight on for that greater recognition and authority that the work demands and that eventually will most surely be given them. The industry awaits with interest the appointment of the contest committee and the announcement of the plan under which the Hurley prize will be administered.

The Loaded Submarine Cable

THERE is much new and interesting information in the official description of the New York-Azores loaded telegraph cable, as given in O. E. Buckley's paper in the July number of the *Bell System Technical Journal*. Stated briefly, the loaded cable has four times the traffic capacity of an ordinary cable of the same size and length. Speeds of approximately two thousand letters per minute have been realized, and these facts promise to revolutionize the art of submarine telegraphy. This accomplishment is due to a narrow, thin tape of "permalloy" which is wrapped spirally in one layer on the central copper conductor. The alloy of nickel and iron has very high permeability, high resistance and low hysteresis loss at the low values of magnetic intensity due to telegraphic currents. In these particulars the material far exceeds all others that have been tried for the loading of cables. In the case of permeability, for example, its value is 2,300 as against 115 for the soft iron used for loading the Key West-Havana cable.

Equally interesting is the indication of the high degree of elaboration of the theory governing the performance of such cables, its check by artificial laboratory lines and its application to the design of the cable. The value of the principle of balancing distributed capacity by distributed inductance in all types of electric transmission has long been known, and its particular value in telegraphic cables was pointed out by Heaviside in 1893. But there has been a great deal of evidence as to the efforts being made by cable engineers to realize the advantages promised until the application of the principle of loading in the Krarup cables abroad and now in the much better permalloy cables on this side.

The limitation of the speed of a cable is found in the blurring of the code signals on the recorder tape. This blurring may be caused by distortion due to imperfect balancing of the cable constants by the terminal apparatus, to interference due to local disturbances and stray currents arising in the grounded connection and terminal equipment, or to the weakness of the received signals. Increasing care in the design and adjustment of terminal equipment for duplexing have largely removed the difficulties due to distortion, and filters and other circuit arrangements have greatly reduced the interference by local currents. Yet the latter cannot be completely removed and it is the relative magnitudes of the received signals and the local interference which determine the speed of the cable. Amplifiers cannot clear up the shape of the signal. Thus the great improvement effected in the permalloy cable is the reduction of the attenuation of the various frequencies transmitted in the telegraphic code. This means that for a given amplitude received the frequencies and so the speed of transmission may be pushed higher. Nothing could appear more simple than the wrapping of an alloy tape about a copper conductor, and yet the choice of its dimensions as related to its own constants, as well as those of the cables, has required and found the highest type of engineering knowledge and skill.



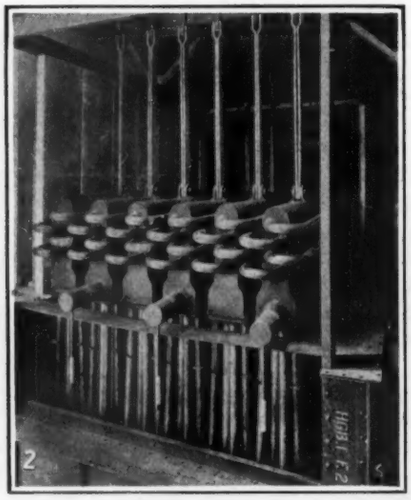
Hartford Improved Mercury Boiler "on the Line"

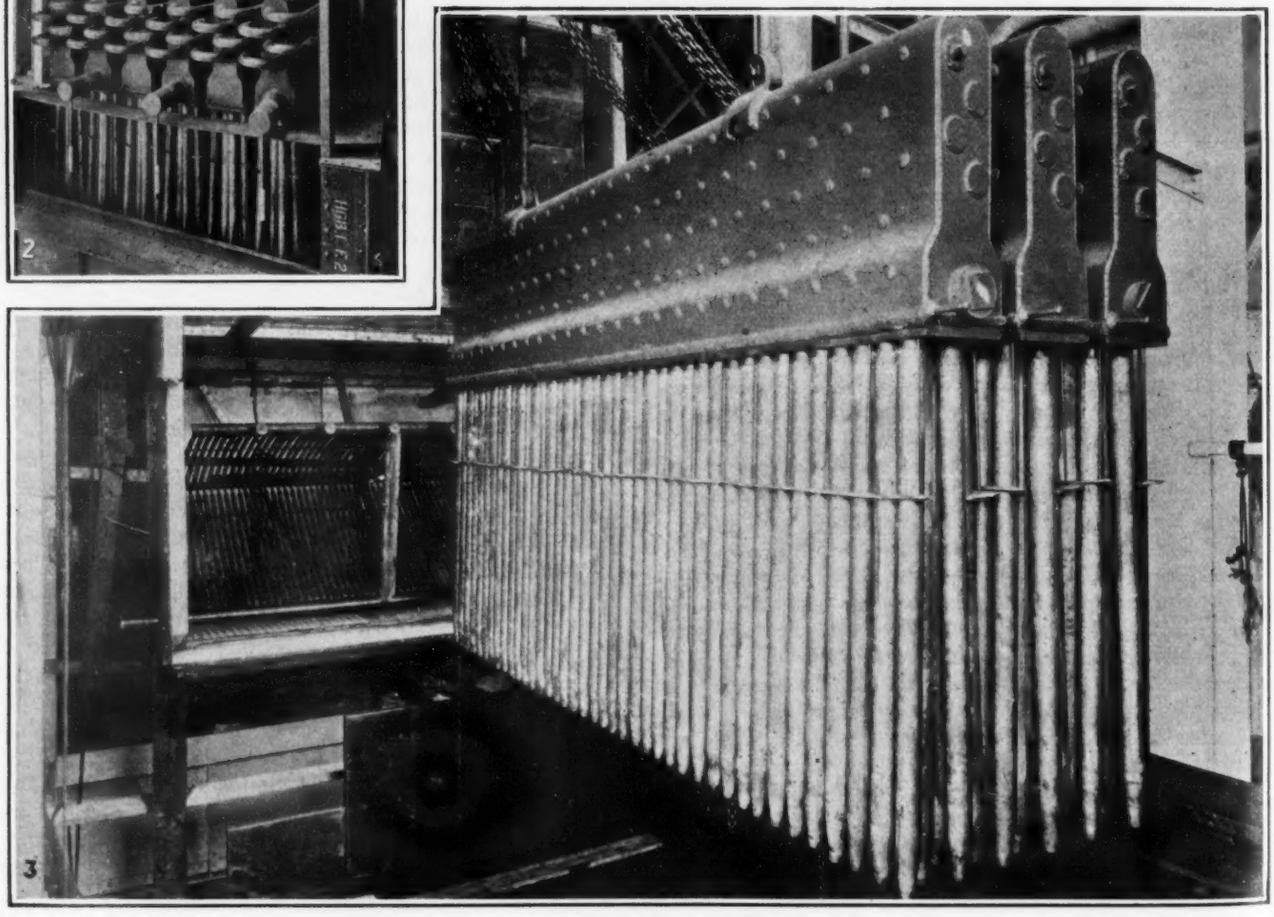
A NEW mercury boiler of the porcupine type was given a commercial run July 29 at the Dutch Point station of the Hartford Electric Light Company, superseding the original boiler which went into operation in the fall of 1923. The new boiler was built by the Babcock & Wilcox Company from the designs of W. L. R. Emmet, consulting engineer of the General Electric Company, inventor of the mercury vapor process. It operates at 70 lb. per square inch, supplying a three-stage turbine-generator unit differing but little in design from the original equipment. The latter delivered a gross total equivalent electrical and steam output of 5,459,722 kw.-hr. before the boiler was dismantled to make room for the second design. The new boiler is so arranged that all tubes receive nearly equal heat, both from radiation and convection. Each tube has its own circulation and the discharge of the vapor cannot interfere with the run-back in any tube.

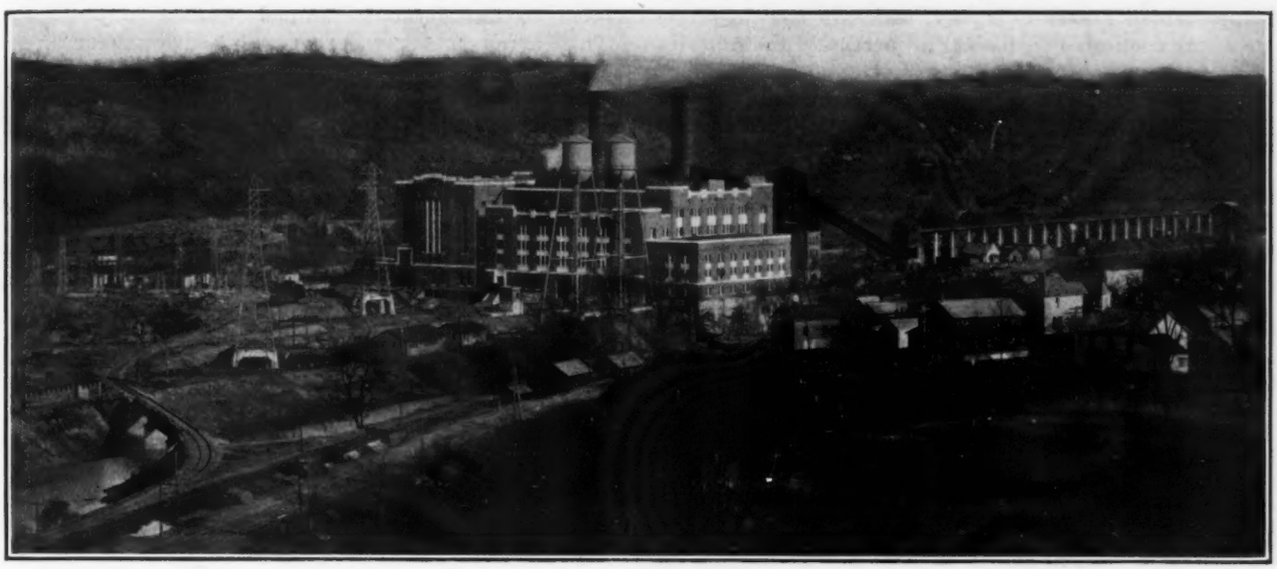
1. Cross-section of boiler and longitudinal view of tube section.

2. Upper portion of tube sections showing headers and superheater tubes connecting front and rear. Three headers equipped with mercury column gage outlets. Mercury vapor drum and header risers at rear.

3. Three sections of tubes with headers blanked off awaiting welding in of superheater tubes. Tubular type of mercury pre-heater economizer at rear.







GENERAL VIEW OF PHILO STATION

Philo Station Sets Record

General Conditions and Mechanical Features—I

The New Plant of the Ohio Power Company Operates on 14,300 B.t.u. for a Month's Period—Design Details and Station Layout Are Given

By M. L. SINDEBAND and P. SPORN
American Gas & Electric Company

AN AMERICAN power station that has operated over a period of one month on 14,300 B.t.u. per kilowatt-hour sets a record for a public service company plant using coal for fuel. This station embodies several departures from past design practices and successfully met the design specifications of operation at 15,000 B.t.u. per kilowatt-hour. It is the result of careful planning both as regards station design and its use in connection with the large interconnected system to which it supplies power.

PLANT SITE

The Ohio Power Company, which operates electrical utilities in Lima, Fostoria, Newark, Cambridge, Canton, Steubenville, and in the Ohio coal fields centering around Wheeling, most of which were then connected by an extensive transmission system, was faced late in 1922 with the necessity of increasing its capacity.

The experience of the company, with the then six years' operating record of its Windsor plant with its comparatively high steam pressure (250 lb.), high load factor, combination mine operation and large coal storage and high-tension outdoor substations, led the management to seek a location for its new plant that would make possible advanced development of these arrangements and enable it to design a plant that would carry further the ideas the soundness of which was so well demonstrated in the case of Windsor.

Fig. 5, which shows the transmission system and location of main generating stations of the Ohio Power Company and those of other subsidiaries of the American Gas & Electric Company, will show some of the reasons why, when the Philo site was found, it was quickly chosen.

In the first place, the site, which is on the Muskingum River, is right in the center of the southern Ohio coal fields, a number of the mines being on the river proper, thus making possible direct river haulage from the mines to the plant. Further, the plant is well located with respect to the two divisions of the Ohio Power Company into which its properties were divided before the building of the Philo-Canton line (see Fig. 5), and it is also well placed for tying in with the Consolidated Light & Power Company at Huntington, with the Kentucky & West Virginia Power Company at Logan and at Sprigg, and with the Virginian Power Company at Charleston, connections with all of which are now in or are under way; and for future connections with the

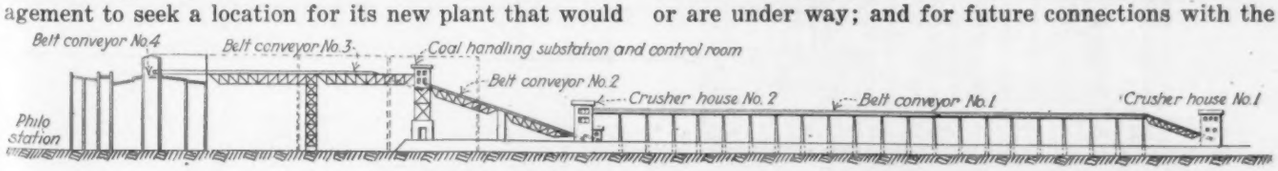


FIG. 1—LONGITUDINAL SECTION OF COAL CONVEYOR SYSTEM

Appalachian Power Company, which is now in process of being connected with other properties of the American Gas & Electric Company at Roanoke and at Lynchburg.

Add to all this the advantages that already existed—a dam across the river with sufficient head to permit a gravity flow through the condenser at all except high flood times; the existence of an old canal leaving the river above the dam, thus cutting off a tract of land and turning it into an artificial island of just about the proper acreage (115 acres) and which almost seemed to have been predestined for use as an intake for condensing water; the location, which was near enough to Zanesville to give a source of labor supply, and the fact that the villages of Philo and Duncan Falls (which are on opposite sides of the Muskingum River) are an ideal location for operators' homes—and the reasons for the choice are apparent.

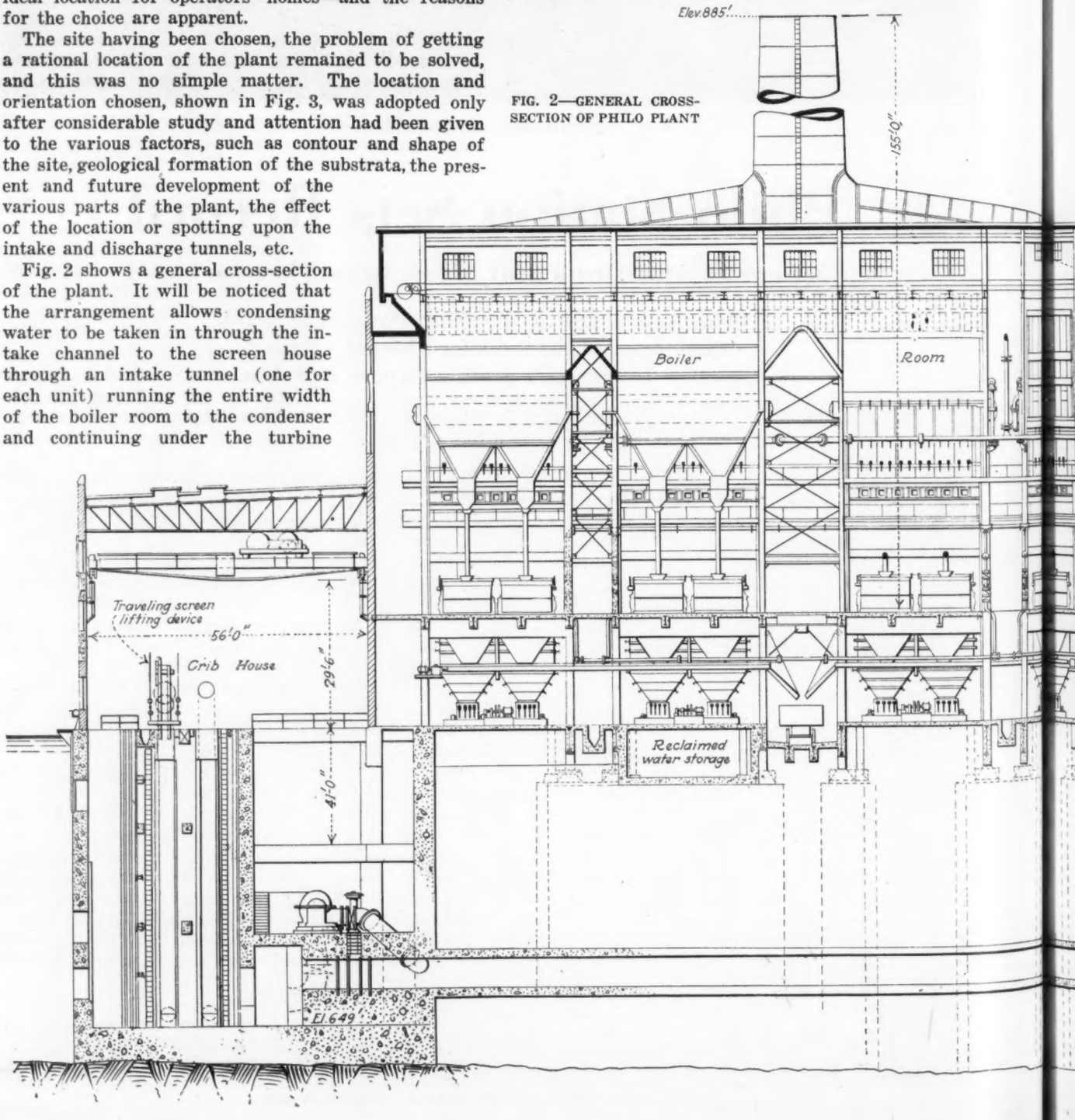
The site having been chosen, the problem of getting a rational location of the plant remained to be solved, and this was no simple matter. The location and orientation chosen, shown in Fig. 3, was adopted only after considerable study and attention had been given to the various factors, such as contour and shape of the site, geological formation of the substrata, the present and future development of the various parts of the plant, the effect of the location or spotting upon the intake and discharge tunnels, etc.

Fig. 2 shows a general cross-section of the plant. It will be noticed that the arrangement allows condensing water to be taken in through the intake channel to the screen house through an intake tunnel (one for each unit) running the entire width of the boiler room to the condenser and continuing under the turbine room to the discharge tunnel leading to the river. This arrangement was not only advantageous from the standpoint of intake and discharge, but permitted full utilization of a portion of the old canal beyond the remotest future limits of the plant as a wet storage basin of 300,000 tons of capacity, and also permitted the location of the high-tension yard so as to allow taking off the 132-kv. circuits without any crossing or recrossing of the yard.

The plant consists of two 35,000-kw.[1] Curtis nineteen-stage turbines designed for 530-lb., 725 deg. F. opera-

[1]After the purchase of the turbines it was found that by raising the pressure to 550 lb. the steam end was capable of delivering up to 42,000 kw. and that the generator end, by grooving and forced draft fan circulation, could be brought up to 40,000-kw. capacity. These arrangements were therefore carried through and the units are now operated as 40,000-kw., 95 per cent power-factor units.

FIG. 2—GENERAL CROSS-SECTION OF PHILO PLANT



tion with provision for extraction and reheating to 725 deg. between the seventh and eighth stages, and extraction at the twelfth and sixteenth stages for feed-water heating. This size and type of unit seemed to offer most attractive and at that time as yet unattained economies when operating under design conditions. The reheat and extraction arrangement seemed particularly promising from the economy standpoint and further offered a solution to the problem of eliminating trouble due to blading erosion at the low-pressure end of the machines.

In Fig. 4 there is shown a heat flow diagram and a heat balance summary for a load of 35,000 kw. per hour, and it will be seen that an operating economy of 15,000 B.t.u. per kilowatt-hour was predicted. The actual economies since obtained over a month's period are 14,300 B.t.u. on the high-tension feeders, and have more than borne out the advance studies and predictions. Further, it was very definitely proved that practically as great economy could be obtained from this unit at one-quarter load, one-half, three-quarters as at full load, and that this is principally due to the combination of reheating and extraction[2].

[2]For a more detailed description of Economies see *Power*, May 12, 1925.

There are eight boilers with 14,080 sq.ft. heating surface each, six being standard boilers and two being reheat boilers. The condensers are two-pass vertical, the tubes being rolled at the intake end and packed at the discharge end. The special feature about these condensers is an arrangement for reversal of flow so as to obviate the necessity of cleaning; thus, although the plant has been in operation now for more than eight months, no cleaning has been found necessary, although periodic reversals of flow have been resorted to.

The plant was designed for base load operation, and the unit idea was followed throughout. Thus each unit has its own three standard boilers and one reheat boiler, its own auxiliaries, its own heaters, de-aërators, etc. The plant can thus be operated with either a single unit or, ultimately, with six units on the line with practically the same thermal economy.

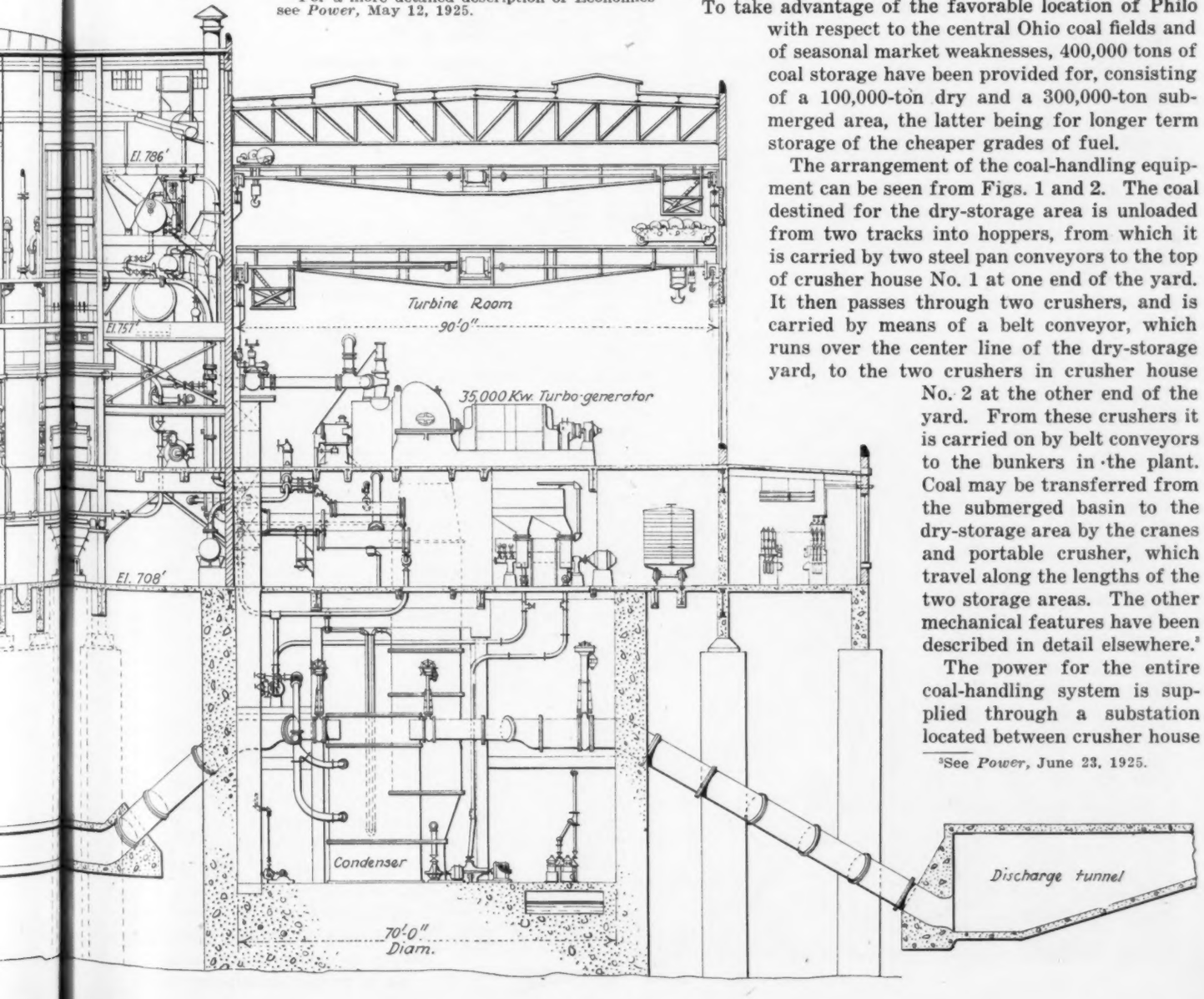
Each boiler is provided with its own ash grinder operating under a wet ash seal. The ground ashes are sluiced away through two sluiceways running lengthwise through the boiler room into pumps, and from there are pumped to the yard to points requiring filling, or they can be flushed to concrete pits and handled into railroad cars without an overhead crane.

To take advantage of the favorable location of Philo with respect to the central Ohio coal fields and of seasonal market weaknesses, 400,000 tons of coal storage have been provided for, consisting of a 100,000-ton dry and a 300,000-ton submerged area, the latter being for longer term storage of the cheaper grades of fuel.

The arrangement of the coal-handling equipment can be seen from Figs. 1 and 2. The coal destined for the dry-storage area is unloaded from two tracks into hoppers, from which it is carried by two steel pan conveyors to the top of crusher house No. 1 at one end of the yard. It then passes through two crushers, and is carried by means of a belt conveyor, which runs over the center line of the dry-storage yard, to the two crushers in crusher house No. 2 at the other end of the yard. From these crushers it is carried on by belt conveyors to the bunkers in the plant. Coal may be transferred from the submerged basin to the dry-storage area by the cranes and portable crusher, which travel along the lengths of the two storage areas. The other mechanical features have been described in detail elsewhere.[3]

The power for the entire coal-handling system is supplied through a substation located between crusher house

[3]See *Power*, June 23, 1925.



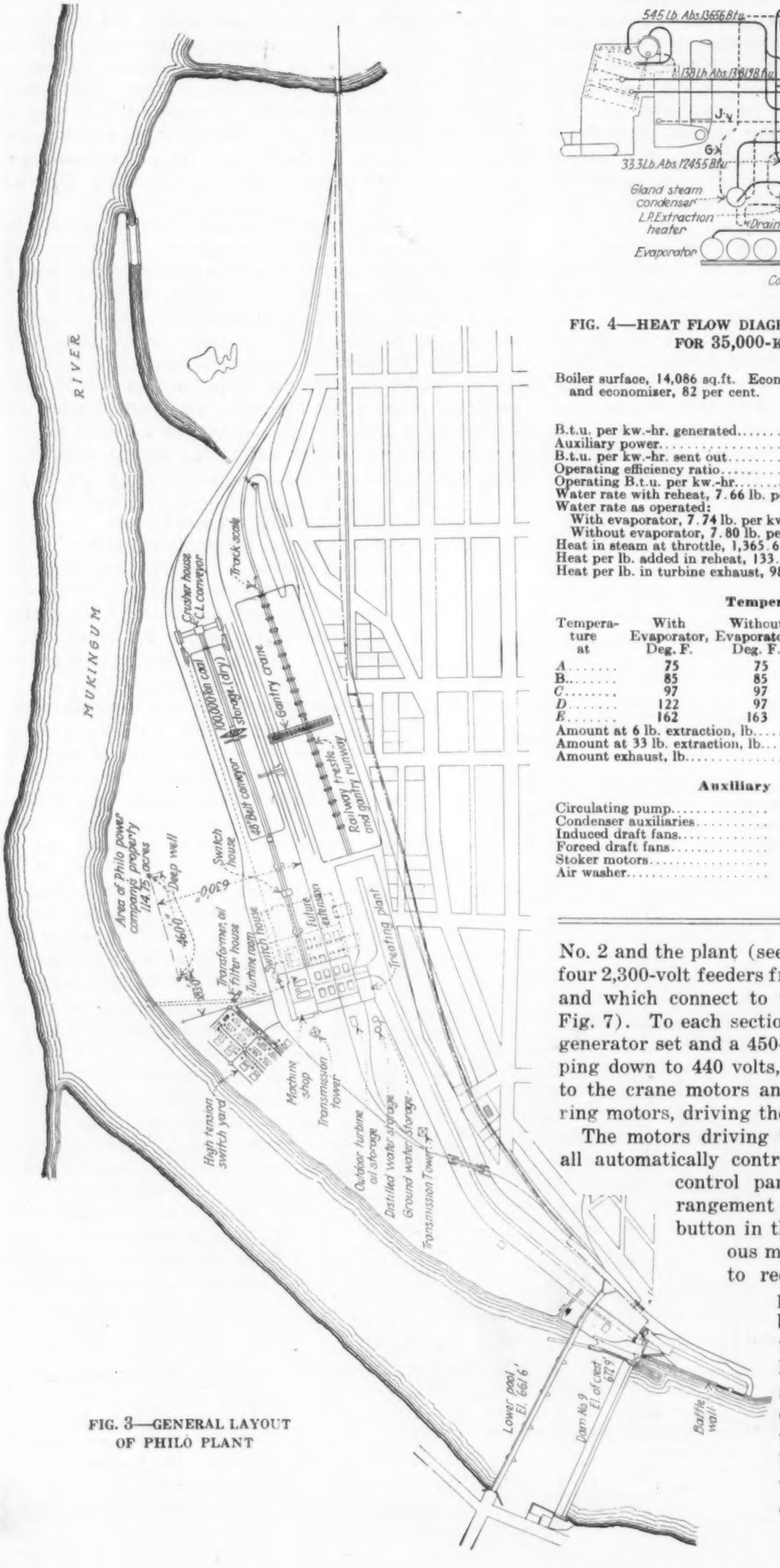


FIG. 3—GENERAL LAYOUT OF PHILO PLANT

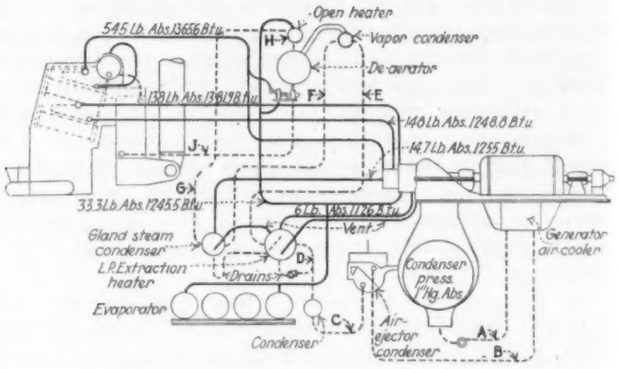


FIG. 4—HEAT FLOW DIAGRAM AND PERFORMANCE STANDARD FOR 35,000-KW. OUTPUT PER UNIT

Boiler surface, 14,086 sq.ft. Economizer surface, 8,837 sq.ft. Efficiency boiler and economizer, 82 per cent.

	With Evaporator	Without Evaporator
B.t.u. per kw.-hr. generated	13,262	12,887
Auxiliary power	487	610
B.t.u. per kw.-hr. sent out	13,490	13,497
Operating efficiency ratio	0.90	0.90
Operating B.t.u. per kw.-hr.	15,277	14,997

Water rate with reheat, 7.66 lb. per kw.-hr.
Water rate as operated:
With evaporator, 7.74 lb. per kw.-hr.
Without evaporator, 7.80 lb. per kw.-hr.
Heat in steam at throttle, 1,365.6 B.t.u.
Heat per lb. added in reheat, 133.1 B.t.u.
Heat per lb. in turbine exhaust, 985.7 B.t.u.

Temperature Conditions

Temperature at	With Evaporator, Deg. F.	Without Evaporator, Deg. F.	Temperature at	With Evaporator, Deg. F.	Without Evaporator, Deg. F.
A	75	75	*F*	187	188
B	85	85	*G*	205	206
C	97	97	*H*	212	212
D	122	97	*J*	187	187
E	162	163			
Amount at 6 lb. extraction, lb.				10,500	16,650
Amount at 33 lb. extraction, lb.				.....	1,600
Amount exhaust, lb.				11,100	.....

Auxiliary Power in Kilowatts

Circulating pump	420	Service pump	50
Condenser auxiliaries	150	Coal handing	75
Induced draft fans	400	Miscellaneous and lighting	25
Forced draft fans	125		
Stoker motors	18	Total	1,288
Air washer	25	Boiler feed pump	372
		Total	1,660

No. 2 and the plant (see Figs. 1 and 2), which is fed by four 2,300-volt feeders from the auxiliary bus of the plant and which connect to two separate bus sections (see Fig. 7). To each section is connected a 300-kw. motor-generator set and a 450-kva. bank of transformers stepping down to 440 volts, the former supplying 550 volts to the crane motors and the latter supplying the slip-ring motors, driving the crushers and belt conveyors.

The motors driving the crushers and conveyors are all automatically controlled, standard contractors and control panels being employed. The arrangement is such that a master push button in the control house starts the various motors singly and in proper order to reduce the starting load and to prevent coal accumulating on the belts. Emergency stop push buttons are provided in the crusher houses and along the conveyors, so that in case of emergency all conveyors carrying coal toward the push-button station that has been actuated will shut down but will leave still in operation the conveyors carrying coal away.

By a proper manipulation of

FIG. 5—TRANSMISSION SYSTEM OF THE OHIO POWER COMPANY AND CONNECTED SUBSIDIARIES OF THE AMERICAN GAS & ELECTRIC COMPANY

switches on the master control panel, four general schemes of automatic operation can be obtained:

1. Through operation—that is, conveying of coal from the track hoppers to the coal bunkers in the plant.
2. Hoppers to storage yard—that is, conveying of coal from track to yard, the coal being deflected from the belt conveyor by a tripper in the crane housing.
3. Storage yard to bunkers—that is, conveying of coal from the yard to the bunkers in the plant.
4. Crushers idle. All belts running to clear slack coal.

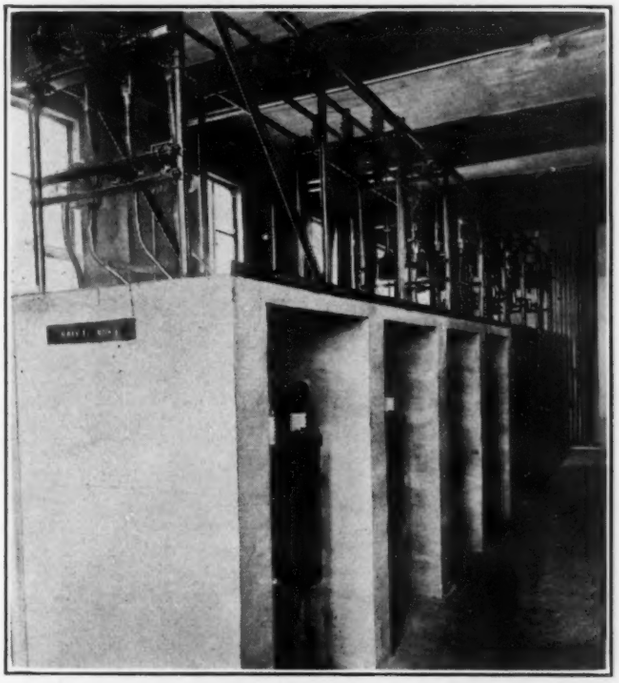


FIG. 7—BUS COMPARTMENTS IN COAL-HANDLING SUBSTATION

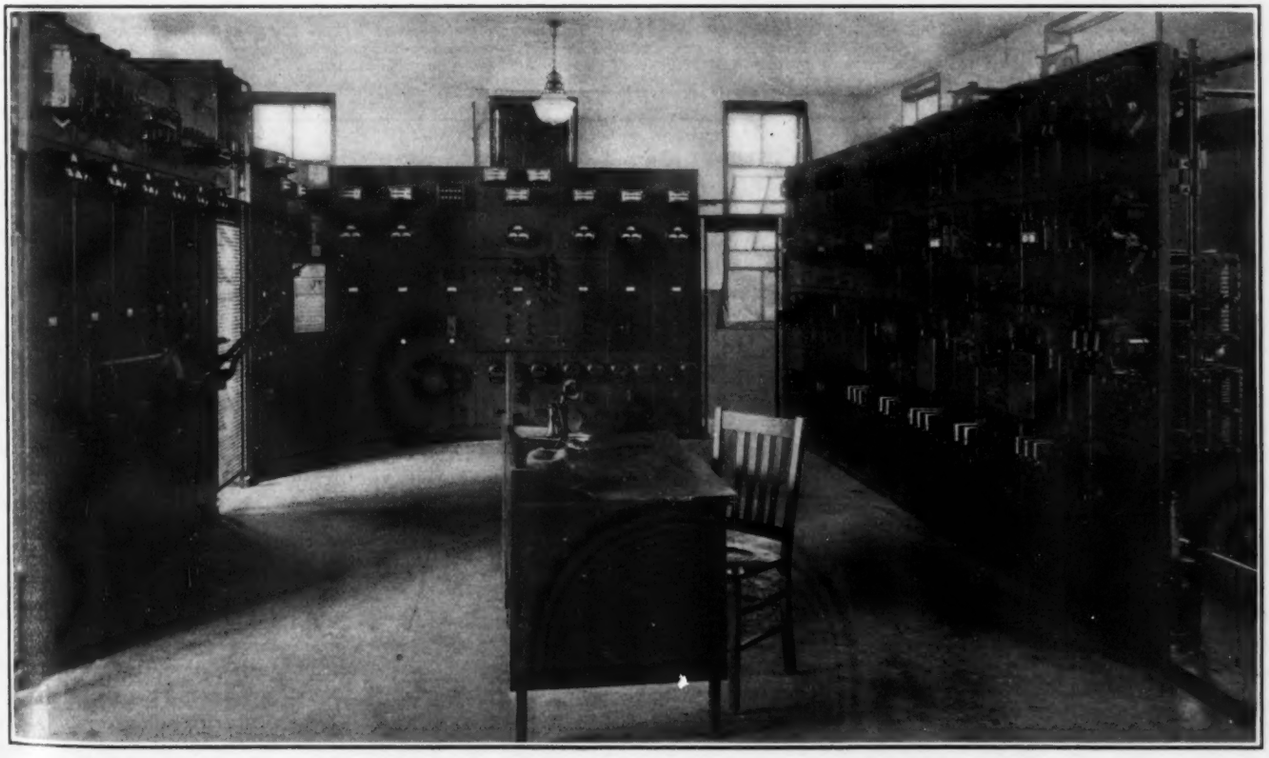
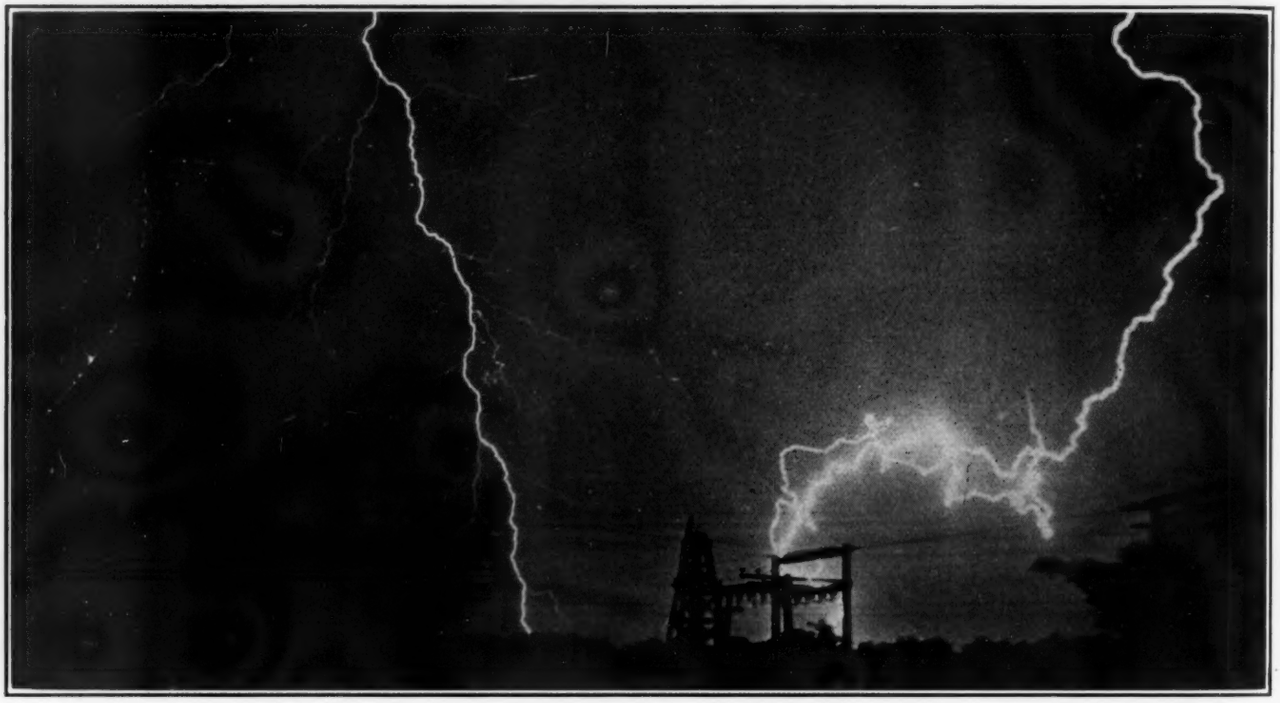


FIG. 6—COAL-HANDLING SUBSTATION CONTROL ROOM

High-Voltage Insulator Development

Ample Safety Factors Should Be Used — Modern Systems Demand Heavier Duty Parts —Developments in High-Strength Insulators—Protection of Units and Use of Grading Shields for Arc Control

By K. A. HAWLEY
Chief Engineer Locke Insulator Corporation, Baltimore, Md.



THE CHIEF HAZARD TO TRANSMISSION

An actual picture of three streaks of lightning, taken in Drumright, Okla., by J. O. Thompson, employee of the Sapulpa Oil & Refining Company. The picture was taken with a 3x4 Kodak and then enlarged; a twenty-minute exposure was necessary to get the three flashes. In the foreground is a switching station and electric lines, the property of the Oklahoma Gas & Electric Company. Just to the left of the switching station is an oil derrick, neither of which was struck.

INTERCONNECTIONS and extensions of power systems are going on at such a rapid rate that careful thought must be given to transmission design in all of its details. Interruptions to service, which on small lines are so rare as to be endured and considered only as a necessary evil, on larger systems become so serious as sometimes to make such extensions seem of doubtful economic value.

If electrical safety factors are not also increased on these networks of transmission lines, connected with large generating capacity, the interruptions to service, the number of customers affected, as well as the damage to apparatus by each interruption, all increase in proportion to the size of the system.

If it were possible, it would be well so to design stations and lines that short circuits could not occur. Liberal designs, with greater spacings between conductors and structures, will help to reduce short circuits to a minimum. However, as long as transmission lines must operate in the open air along unguarded rights-of-way where they are swayed by every wind that blows, are hit by passing lightning storms and become the roosts for birds, the design of stations and lines entirely to obviate such troubles becomes a most difficult problem and requires the highest engineering consideration. All of these possible causes of trouble, however, are of finite value and much may be expected in the way of eventual correction, even protection against severe lightning. Everything possible must consequently be done to prevent arcs from starting. One means of accomplishing this is to provide ample and proper insulation.

Where pin-type insulators are used, minimum sizes, according to the manufacturer's ratings, should not always be selected. It is now possible to get arc-over data measured by sphere gap in accordance with the specifications of the A.I.E.E., as followed by the makers of switches and transformers, so that relative safety factors may be studied. Careful inquiry always should be made to be sure that the data are given on a similar basis. Pins for mounting the insulators should also be of liberal height; the next larger pin height from that catalogued as the minimum size for any insulator is frequently good practice.

With suspension insulators especially attention must be given to clearances from live parts to ground in all directions. An arc to the cross-arm below may be as disastrous to service as one to the arm that supports the insulator from above. Although the dielectric strength of the air from the conductor to the lower arm

is greater per unit length than along the insulator, care must be taken lest this distance be made too small.

MODERN SYSTEMS DEMAND HEAVIER DUTY PARTS

As stated before, the capacity behind transmission systems has grown, imposing more severe conditions and making essential a greater freedom from interruptions to service than on small systems. Coupled with the growth of systems are two other factors which, whether or not we welcome them, are realities and past the stage of discussion. These are: (1) Higher voltages, and (2) construction involving higher loadings and greater factors of safety in mechanical strength.

The economic use of pin-type insulators has long since been limited to lower voltages. In the case of suspension insulators, the problem has been solved temporarily by the addition of more insulators to the string. In the realm of proposed voltages, devices are now available to limit the stress on the lower units to those values that are now giving satisfactory service.

In any construction involving higher mechanical loads, the use of pin types has been limited more by the strength of the commercial mountings than by the insulators themselves.

So far as suspension units are concerned, the design and manufacture of insulators has provided a higher mechanical strength with no sacrifice to the electrical characteristics or life as compared with previous standards.

NEW DESIGN OF HEWLETT INSULATOR USED ON 132-KV. LINE

Heavy-duty lines are generally accompanied by high voltages and the use of the suspension-type insulators. Conductor strengths no longer limit the length of spans. Tower spacings now are determined by economical tower heights, the profile of the ground passed over and such considerations as crossings over other public service utilities, railroads and main highways.

With heavier lines, the mechanical loadings of insulators must be carefully considered and proper safety factors established to care for any possible load that may be thrust on the system by sleet and ice, hurricanes or broken conductors.

Recent improvements in suspension insulator designs make it no longer necessary to use at any point low-strength insulators on the basis that their rate of failure is less than that of the higher strength units. The selection of high-strength or medium-strength units becomes of necessity a matter of economy.

Most power companies prefer to use suspension insulators of medium strength and high strength. The demand for the light-duty, or low-strength, insulators is waning. As the manufacturing costs of these are nearly the same as for those of the medium strength, little is gained either by the manufacturer or customer, and the low-strength insulator is therefore practically without economic justification.

The demand for heavier parts on the transmission line because of several rather disastrous failures from sleet storms, and also because of longer spans and heavier conductors, has caused many investigations to determine the strength of insulators in duration tests.

It is a relatively simple matter to design and manufacture a suspension unit of the conventional cap-and-pin type that will develop great strength on a quick pull test, but the life of which at heavy loads is limited or which will fail at much lighter loads if applied over a period of time.

A few years ago a long series of tests showed that practically no standard or medium-strength insulator could be expected to stand much more than 6,000 lb. on time loading. It is known that in many parts of the country sleet storms do occur occasionally of greater severity than are considered in usual loading tables and that such severe loads may be placed upon the insulators.

THE DEVELOPMENT OF HIGH-STRENGTH INSULATORS

It is well, therefore, to use at least the same safety factors in the selection of insulators as in any other part of the structure. By the use of the high-strength insulator it is usually possible to reduce the hazardous use of double, triple or quadruple strings of low-strength units and yet retain the same safety factor. Careful studies of insulator fractures resulting from duration tests have shown that real improvements in the hardware could be made. The ordinary suspension insulator of the cemented type consists of a cap of malleable iron, a porcelain shell and a forged steel pin, all held together with neat portland cement. In many designs the cap has been roughened on the inside, generally with annular rings placed without any special plan.

Careful calculations and tests were made involving strengths, coefficients of expansion and moduli of elasticity of all parts. It was surprising to find almost a complete disregard of the most flexible part of the assembly—the portland cement and the porcelain itself. Each is nearly ten times more elastic than the steel pin, and together they are capable of caring for the distribution of the loads upon themselves when properly designed without the necessity for any special flexible features within the hardware itself. It was found by the resulting changes in the shape of the hardware that did not involve any fundamental difference in the appearance of the insulator that the strength in time-loading tests was greatly extended.

The beneficial results of this development have been incorporated in the more recent designs. Such insulators are built like an arch, with abutment, intermediate pieces and keystone. The load has been more carefully delivered to the porcelain part and the forces against it have been more carefully balanced. The hazards are therefore greatly reduced. Nor is there any danger to the hardware parts. The time-load tests

have been made in out-of-door frames during all kinds of weather. The usual loading increment was 1,000 lb. per week until failure occurred. Alternate steam and rain tests, under tension, have been made without resulting trouble.

These long-time load tests have established values that may be termed as elastic limits for the insulator combination. The elastic limit for the standard strength has been determined as at least 10,000 lb. and the elastic limit of some of the latest design high-strength insulators is at least 18,000 lb.

The use of portland cement in suspension insulators does not appear as a source of trouble. It is thoroughly expanded and set in the factory by means of free steam before shipment. Thereafter it does shrink and gives necessary freedom for thermal expansion. Since the process of steaming insulators was inaugurated and since the use of expansion joints, reports of troubles to porcelain insulators have practically stopped so far as the manufacturer is concerned. These improved designs have been in heavy service for many years and have fulfilled all expectations.

Thus, by intelligently applying the principles of well-known fundamental laws, combined with many years experience with, and observation of, the behavior of various combinations of porcelain, cement and metal, changes in the mechanical relations of these elements have resulted in the development of a higher mechanical strength that is demanded by the progress of the industry. These increased strengths in both the heavy-duty and medium-strength insulators have been secured at no sacrifice of ultimate life.

Experience and data are now available to show that units of 20,000 lb. or more ultimate strength are satisfactory and reliable, even under the most severe service conditions.

PROTECTING INSULATORS AND CONDUCTOR FROM DESTRUCTIVE ELECTRICAL ARCING

As previously stated, troubles on transmission lines that in the past have not been considered serious are now, on large systems, very costly not only because of the damage to materials such as insulators and conductors but because of the costly interruption to service on which many industries depend for motive power day and night.

Most of the troubles on high-voltage transmission lines are caused by flashovers either across the strings of insulators or from line to tower. Flashovers occur chiefly during thunder storms or as a result of arcing grounds, and in some cases from insufficient clearance between line and tower under conditions of maximum swing toward the tower caused by wind. The induced voltage from lightning frequently reaches far in excess of the normal flashover voltage; therefore the increase of this flashover voltage by a few per cent will not solve the problem.

The resistance to arc-over during lightning storms, or from switching or other highly damped surges, may be actually increased by the use of proper devices, even though they may reduce the space to ground as well as the normal frequency arc-over values. Science has yet to find the presence of any high-frequency waves upon transmission lines with grounded neutral, except lightning and other waves of highly damped character, such as internal surges from switching, which are usually not more than twice line voltage. Modern insulators, because of their high impulse ratio, do not succumb to such waves. This leaves lightning and mechanical effects such as dirt as the chief causes of insulator troubles.

On new construction the frequency of flashovers may be reduced by providing greater clearances and longer insulator strings. On existing lines, however, any effort to obtain increased spacings for which no provision was originally made is usually handicapped by excessive cost. Reduction of insulator string length to obtain greater clearance to tower is likely to cause flashover across the insulators. An increase of insulator string length is likely to cause more frequent flashovers to tower, with the danger of melting the conductor or damaging tower struts.

Relays and switching equipment, because of their limitations, fail to break the arc, when once formed, quickly enough to prevent damage. It is desirable to prevent arcs from forming at all, but it is far more important, when they have once formed, that they should be so controlled as not to cause long interruptions and destruction to valuable equipment.

FIG. 1 — DOUBLE STRAIN STRING EQUIPPED WITH GRADING SHIELD AND ARCING HORNS

In the absence, therefore, of any device to prevent flashovers, there is created a demand for a device that will protect the insulators and the line conductor from destruction, and even from damage when flashovers occur. The grading shield is a proved device that will keep the power arc away from the insulators, and so prevent the breakage of the porcelain and the burning of the hardware parts.

The typical grading shield consists of top and bottom arcing control and grading members. The top member is usually an arcing horn, the points of which freely clear the top unit approximately in line with the lower skirt. The bottom member is an arcing ring made of metal, round or elongated in shape, placed with respect to the lower units to produce proper grading of the insulators and proper arc control. It is usually split longitudinally and held by supporting arms with adapters for attaching to nearly any standard clamp. As designed and made, it can be installed on any existing line without lifting the weight of the conductor or disturbing the insulators or hardware.

At frequencies of induced lightning charges, which are the most frequent and severe causes of flashovers, the flashover voltage of a string of insulators equipped with grading shield is actually higher than without it. On higher voltage lines such as 220 kv., correction of the gradient is of great importance. On lower voltage lines, such as 132 kv., the gradient correction is more incidental and protection is generally the object.

Millions to Read Central Station's Story

National Electric Light Association and Electric Utilities Launch a Nation-Wide Plan to Inform Customers and Security Holders of Important Facts Concerning the Electric Light and Power Industry

COMMENCING in September, a nation-wide effort will be launched by many electric light and power companies, with the assistance of the National Electric Light Association, to carry the central-station industry's story to the public. At that time and every month subsequently for one year consumers of electrical energy will receive a four-page pamphlet written by Bruce Barton, bringing out and clearly explaining certain important features of the central-station industry which today hold the attention of the public and of legislators as well as of many newspaper writers and orators.

These messages are the "Barton envelope stuffers" prepared by Mr. Barton for the Public Relations Section of the N. E. L. A. and approved at the San Francisco convention in June, for sale at cost to member companies. In addition to the envelope stuffers which are to be inclosed with customers' monthly bills, the N. E. L. A. committees have prepared a series of four messages covering in detail four distinct features of the business and which are intended to be mailed to customer-stockholders with quarterly dividend checks.

So far orders have been received from electric light and power companies for more than five million sets of the envelope stuffers and for about five hundred thousand sets of the series of pamphlets to go to security holders. As there are thirteen pamphlets in each set of the first series and four in the second, this means that at least sixty-seven million separate messages will be placed in the hands of individuals—customers and stockholders—within the next year. It is believed that this is the largest single piece of publicity work ever undertaken by any industry and it promises to be of inestimable value to the electrical industry in clarifying some questions which still exist in the public mind.

Important Problems Discussed

The series of envelope stuffers was designed to familiarize consumers with what the electrical industry has accomplished under private control and the problems it has had to face and overcome. A chart showing that while the cost of living has increased 6 per cent since 1914 the cost of electricity has been on a steady decline is printed in every leaflet. The folders contain four pages, 3½ in. x 4½ in., printed in red and black. The text is in large type and straight to the point. A cartoon on the first outside page and one or two on the inside pages are shown. Titles and design are arranged to provoke the interest and curiosity of the readers. They include the following: "All in Favor of Paying More Taxes Say, 'I'," "Orator and Business Man," "Like Finding $13," "Like the Federal Reserve System," "Suppose All Your Bills Were Reduced 65 per Cent," "Yes! Grapefruit Is Cheap in Florida," "Regulation," "Service at Cost," "A Capitalist," "Why Not Generate All Electricity at the Coal Mine?" "Niagara," "Why Did 860 Municipally Owned Plants Close?" and "Muscle Shoals." The text of two of the pamphlets, given here, shows the concise and effective method of presenting important facts:

YES! GRAPEFRUIT IS CHEAP IN FLORIDA

A. "I guess I'll run down to Florida and get a grapefruit—I understand you can get one for nothing down there."

B. "That's a good idea; the carfare is only $57.16."

But to pack it and deliver it to your grocer—that's where the cost comes in.

If you went to Wyoming and killed a steer and cut it up, your steak would cost very little.

But how about the cost of getting it home?

If you could go to your electric light company and buy a package of electricity and carry it home in a basket, the rate would be lower than it now is.

Only 20 per cent of electricity's cost is in manufacturing: 80 per cent is delivery cost, taxes, interest on the investment and service.

The average cost of all other commodities has gone up 65 per cent since 1913. Contrast this with the achievement of the electric light and power industry in lowering the cost of electricity during the same period.

Electricity is the cheapest comfort in your home. Remember, too, that of every dollar you pay, only 20 cents is for making the current; 80 cents is the cost of delivering service from the power plant to the customer.

"ALL IN FAVOR OF PAYING MORE TAXES SAY, 'I'"

Suppose a candidate were to run for office on this platform:

"If elected I promise to increase the taxes of every family $7."

How many votes would he get?

Your taxes would have to be raised if electric light and power companies were owned by cities, states or the national government. For such politically owned companies pay no taxes, while the electric light and power companies, under their present ownership and under public regulation, pay taxes of $150,000,000 a year.

This is more than $7 for every family in the United States.

It is better for government to govern and let business be run by business men.

Particularly when the business men have been able to keep the cost of their product down in the very years when the average cost of all other commodities has risen 65 per cent.

That is what the business men who run the electrical industry have been able to do.

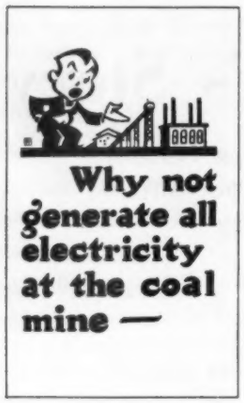
The folders designed for stockholders are somewhat larger than those to be used with monthly bills and bear the titles "What Is a Holding Company?" "What Is Superpower?" "What About Service at Cost?" and "If All the Streams Were Harnessed." The text of the last-named folder is reproduced here:

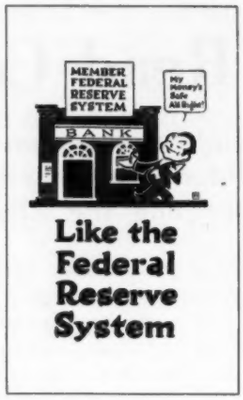
IF ALL THE STREAMS WERE HARNESSED

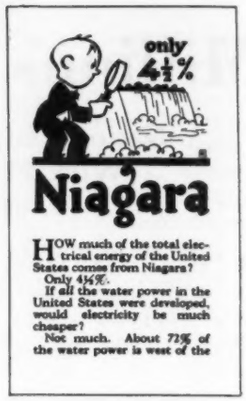
Recently a farmer in North Dakota asked an electrical engineer: "When will Niagara Falls reach out here?" His question was typical of much of the misconception regarding the present problems and future development of the electrical industry.

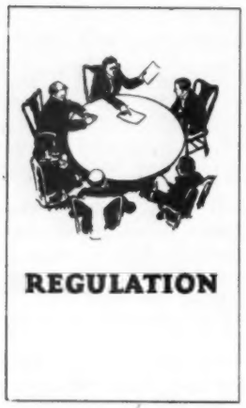
You, as one of the owners of the industry, will be interested in the following facts:

1. Niagara Falls, great as it is, furnishes only about 4½ per cent of the nation's electrical energy.

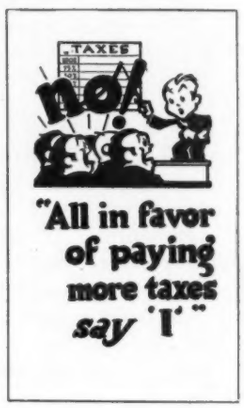




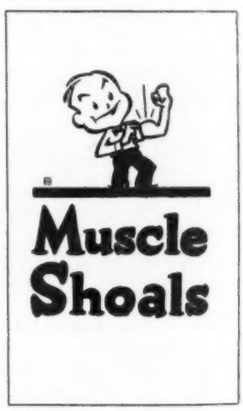

only 4½%
Niagara
HOW much of the total electrical energy of the United States comes from Niagara?
Only 4½%.
If all the water power in the United States were developed, would electricity be much cheaper?
Not much. About 72% of the water power is west of the

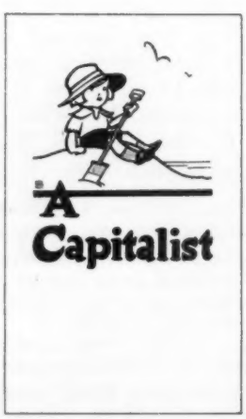


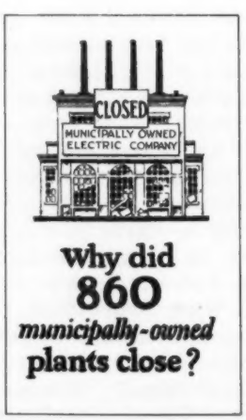
WHAT IS SUPERPOWER
WHAT ABOUT "SERVICE AT COST"
?
WHAT IS A HOLDING COMPANY
?
IF ALL THE STREAMS WERE HARNESSED
I guess I'll run down to Florida and get a grapefruit — I understand you can get one for nothing down there
That's a good idea, the carfare is only $57.16
Yes! grapefruit is cheap in Florida



Problems of the Industry Are Discussed in a Series of Thirteen Pamphlets to Be Mailed Monthly to Customers of Central-Station Companies and Four Folders Directed to Security Holders







2. Muscle Shoals, when completed and running at full capacity (as we hope it will be), will generate less electrical energy than one single plant in Chicago generates now.

3. If all the streams were harnessed, we should be little better off. For 72 per cent of the country's water power is west of the Mississippi, while 79 per cent of the demand for electrical energy is east.

Certain publicists have already given fresh currency to the old suggestion that all electricity should be generated at the mouth of the coal mines and distributed from there. They do not know that:

1. Electricity can be economically generated by steam only near a large supply of pure water. For every ton of coal burned in an electric light and power plant 400 to 600 tons of water must be pumped to condense the steam that drives the big turbines. Most coal mines are not near water.

2. The longest distance which electricity can be transmitted economically over wires at present and compare favorably with local power is 250 miles.

3. The cost of generating electricity is only about 20 per cent of the total bill. (Just as the cost of raising and slaughtering a steer is a small fraction of the cost of your beefsteak.) The other 80 per cent is the cost of delivering the service from the power plant to the customer.

Electricity is a magic thing—very stimulating to the imaginations of orators and self-appointed friends of the people. But the business men who have built up the electrical industry are not overlooking any bright ideas. They are alive to every possibility of reducing costs and improving service. The best evidence of this is shown by the fact that the electrical industry has been able to keep the price of its product down, while all other prices have mounted 65 per cent.

Power-Factor Correction in Hosiery Mill

Experiences of the Gotham Silk Hosiery Company—Overloaded Circuits and Poor Operating Results Remedied by the Use of Static Condensers at Motor Terminals—Analysis and Details

By E. N. DITTENHOFER
Engineer Gotham Silk Hosiery Company

A FULL-FASHIONED hosiery mill uses many small induction motors that operate at an average power factor of 30 to 40 per cent because of the requirements of the duty cycles. This poor power factor and the incidental effects on regulation and operation make it necessary to study the electrical features of a hosiery mill very carefully to obtain the most economical installation from a production standpoint.

The experiences of the Gotham Silk Hosiery Company in Philadelphia illustrate these points very effectively and indicate at least one method for obtaining a solution to the electrical problems in a full-fashioned hosiery mill.

The original plant of the hosiery company consisted of two brick buildings separated by an engine room. The load was carried by a 75-hp. engine through belts to a line shaft on each of the three floors in the two mills. Later, motors using purchased power were installed on each of the six floors and arranged for belting to the several line shafts. On Jan. 1, 1924, the total load in the old mills that could be driven by either the motors or the engine consisted of the loads shown in Table I.

A new ten-story steel and concrete mill building was erected adjacent to the old plant and connected to mill No. 2 early in 1923. This building was designed for 240 individual full-fashioned hosiery machines to be driven by individual motors.

Two circuits were installed for power supply, one feeding the second, third, fourth, fifth and sixth floors and the other the seventh, eighth, ninth and tenth floors. These circuits consisted of 500,000 circ.mil cables with panel boxes on each floor and No. 8 wire feeders to each group of four 1½-hp. motors. A 40-hp. elevator motor was supplied by a separate circuit of No. 4/0 cable.

Power for the new mill was purchased from the Philadelphia Electric Company and two 100-kva, 2,300/220-volt transformers were installed in a basement vault to care for the load in both the old and the new mill.

On the first of January, 1924, the new mill had in operation eighty-five 1½-hp. motors on the hosiery machines, five 2-hp. motors on seaming tables and three 1-hp. motors on looping tables. This load, together with that already existing in the two old mills, caused trouble through overheating the circuits and transformers, reducing the voltage at the motors and blowing of the fuses. The trouble became so serious that after five days the engine was put back into service to replace the six 15-hp. motors in the old mill.

POWER-FACTOR CORRECTION THE ANSWER

The company at this time seriously took up the consideration of power-factor correction. After careful investigation, it was discovered that a new feeder circuit would have to be run in the new mill at a cost of $1,400 unless at least some of the correction was made at the motors. This fact, together with the very unsatisfactory operating conditions due to the excessive current on our circuits, caused us to accept the plan of the National Electric Condenser Company's engineers.

TABLE I—MILL LOAD ON JAN. 1, 1924

Floor	Full-Fashioned Machines	Motor
Mill No. 1 Line Shaft		
1	23	15 hp., 220 volt, two phase, 720 r.p.m.
2	17	15 hp., 220 volt, two phase, 900 r.p.m.
3	18	15 hp., 220 volt, two phase, 900 r.p.m.
Mill No. 2 Line Shaft		
1	18	15 hp., 900 r.p.m., 220 volt, two phase
2	16	15 hp., 900 r.p.m., 220 volt, two phase
3	18	15 hp., 900 r.p.m., 220 volt, two phase
Mill No. 2 Purchased Power Only		
4	21-18 section	21, 1½ hp., 1,200 r.p.m., 220 v., two phas
Basement	Cone winders	15 hp., 900 r.p.m. on line shaft
Basement	Skein winders	10 hp., 900 r.p.m. on line shaft
Basement	Machine shop	3 hp., 1,200 r.p.m. on line shaft
Total motors in mills, 30		Total hp., 149.5

This plan took into account the original heavy investment in copper and provided for the raising of the power factor of the 1½-hp. full-fashioned hosiery motors at their terminals from 27 per cent to about 65 per cent. This would reduce the current on the circuits sufficiently to enable us to carry the total load on the original circuits, and would also eliminate the serious fuse difficulties caused by excess heating. The difference between 65 per cent and the required 90 per cent power factor on this portion of the load, together with the group drive motors and elevator motor, was to be taken care of by a group condenser located at the metering point, the exact capacity of this condenser to be determined after the installation of the individual condensers at the motor terminals of the full-fashioned knitting machines was made.

The capacity as estimated for our load on May 1, 1924, would consist of 183 kva. in individual static condensers and a 74-kva. group static condenser, and the future load would require an additional 127.5 kva. in individual static condensers and 46-kva. group static condensers. This would make a total installation of 310.5 kva. in individual static and 120 kva. group static.

TABLE II—TESTS SHOWING LOAD AND POWER FACTOR

Test No.	Motor Hp.	R.p.m.	Drive	Nature of Load	Integ. Test, Rene. Kva.	Integ. Test, Rkw.	Time in Min.	Per Cent PF.	Mach. Work.	Ave. No. Mach. Run.	Total Mach. on Motor
				First Floor, Mill No. 1:							
1	15	720	Belt	Knitting machines	{ 5.53 6.50	6.50 6.68	20 10	64.8 71.8	22	16*	23
				Second Floor, Mill No. 1:							
2	15	900	Belt	Knitting machines	5.56	9.50	10	50.52	17	13	17
				Third Floor, Mill No. 1:							
3	15	900	Belt	Knitting machines	4.75	8.97	10	46.8	13	11	13
				First Floor, Mill No. 2:							
4	15	900	Belt	Knitting machines	4.94	6.72	10	59.2	18	12	18
				Second Floor, Mill No. 2:							
5	15	900	Belt	Knitting machines	4.23	8.79	10	43.3	15	11	16
				Third Floor, Mill No. 2:							
6	15	900	Belt	Knitting machines	5.12	9.51	10	47.4	14	12	18
Totals	190				31.10	50.17	..	52.7	99	75	105

* The building elevators were on this line shaft.

This plan was accepted on May 8, 1924, and it was decided to rush the installation of 78 kva. in individual condensers properly distributed through the plant so that the operation of this equipment would eliminate to a certain extent the excessive heating on the circuits and enable us to shut down the steam engine for the summer months. The saving made by shutting down this engine was a material object.

DETAILS OF CORRECTION

The circuit running from the transformer room to the fourth floor in old mill No. 2 was giving trouble and the fuses in the basement had been increased from 100 amp. to 300 amp. Even with this large increase in fuse capacity, one or two fuses blew every two or three days, causing a serious loss in the production of the twenty-one machines on this feeder. By the installation of 31½ kva. on these twenty-one 1½-hp. motors the fuse capacity was reduced to 100 amp. and the excessive heating with the fuse difficulties on the circuit disappeared. The installation of the remainder of the 78 kva. was made on the sixth, seventh and eighth floors in the new mill, the ninth and tenth floors not having any machines in operation. The reason for installing this condenser capacity at the extreme end of the feeders in the new mill was to derive as much benefit as possible in reduced line losses from the condensers in operation. It was found that the installation of this 78 kva. reduced the demand on the transformers to such an extent that it was possible to shut down the engine and transfer its load in mill No. 1 and mill No. 2 to the power company's transformers and carry it satisfactorily.

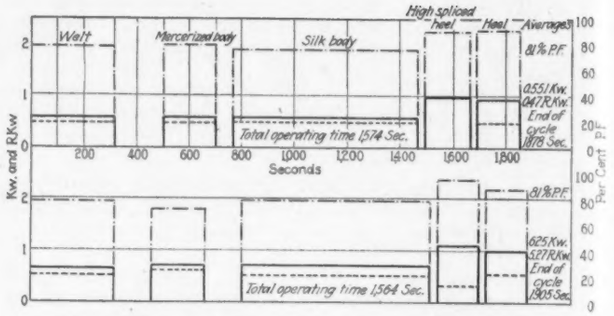


FIG. 1—OPERATING DUTY CYCLE OF A READING EIGHTEEN-SECTION FULL-FASHIONED HOSIERY MACHINE

Top—Equipped with a 1-hp., 220-volt, two-phase motor and 1-kva. condenser.
Bottom—Equipped with a 1½-hp., 220-volt, two-phase motor and 2 kva. in condensers.

The installation of an added 93 kva. was made as quickly as possible on the individual motors in the new mill and upon completion of this installation the kilovolt-ampere demand on the transformers was so materially reduced that the temperature was found to be 159 deg. F. on one transformer and 164 deg. F. on the other with a room temperature of 85 deg. F.

The load on the transformers consisted at this time of an increase of sixteen individual knitting machines and the total capacity of 90 hp. in group drive motors, displacing the engine drive. It was found possible to reduce the main fuses from 800 to 600 amp. on the circuit feeding the upper floors in the new mill.

The plant power factor before the installation of condensers was 49.9 per cent, the motor load being 43.5 per cent. The plant power factor was raised to approximately 55 per cent when the engine was shut down and to 70.3 per cent at the completion of the installation of 171 kva. in static condenser equipment. When the engine was shut down, it was found that the power factor of the motors carrying its load was abnormally low, and a test was made on them. Table II

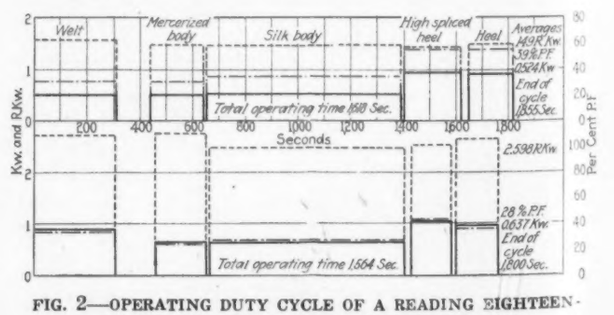


FIG. 2—OPERATING DUTY CYCLE OF A READING EIGHTEEN-SECTION FULL-FASHIONED HOSIERY MACHINE

Top—Equipped with a 1-hp., 1,200-r.p.m., 220-volt motor.
Bottom—Equipped with a 1½-hp., 1,200-r.p.m., 220-volt motor.

shows the order in which the motors were tested and the results that were obtained. During this test seventy-five machines were running out of a total of ninety-nine machines working.

It was found that the load was overmotored and a 10-hp., 1,200-r.p.m., 220-volt, two-phase motor was tried in place of the 15-hp., 720-r.p.m. motor operating twenty-three Reading Textile eighteen-section full-fashioned hosiery machines and the elevator on the first floor of mill No. 1; also a 7½-hp., 1,200-r.p.m., 220-volt, two-phase motor was tried in place of the 15-hp., 900-r.p.m. motor operating eighteen Reading Textile eighteen-section full-fashioned hosiery machines on the second floor of mill No. 1. These motors worked out so satisfactorily that the six 15-hp. motors were replaced by two 10-hp., 1,200-r.p.m. and four 7½-hp., 1,200-r.p.m. motors, making a reduction of 40 hp. in connected motor horsepower on this portion of the load.

After these changes were made, the motors were tested in the same order as in the previous test, and the results shown in Table III were obtained.

During this test eighty-seven machines were running out of a total of 107 machines working. The data in Table III do not represent normal operation of this load. The average number of machines running is generally sixteen, which would raise the power factor to slightly above 90 per cent and the power factor of the total load to 92 per cent.

To these motors was connected 9½ kva. in static condenser capacity at their terminals, which raised their operating power factor to 91.18. The operating power factor of the load with the original motors was 52.7 per cent. The change eliminated 39 kva. in group static condensers from the original figures. A comparison of the two tests shows that the current consumption on the original motor layout was 17.48 per cent more than it is on the present motor layout.

An official power-factor test was made on the plant Dec. 30, 1924, by the Philadelphia Electric Company, and it was found that the power factor of the plant had been raised to 87.8 per cent. The full-fashioned hosiery individually driven machines from the previous power-factor test in August had increased another fourteen machines, making a total of 186 machines in operation at this last test and the condenser capacity installed had increased from 171 kva. to a total of 205 kva.

Fifty more full-fashioned hosiery machines individually driven are to be installed during this year and the motoring of the silk-winding machines is being reduced to smaller motors operating group drive.

MOTORIZATION STUDIES MADE

On account of the very low operating power factor of the 1½-hp. wound rotor motors furnished with the individually driven full-fashioned hosiery machines it was decided to make an investigation of different types and makes of motors to determine whether it was possible to obtain a motor that would give satisfactory operation and not require the correction necessary for the previous motors furnished. Available test data shown in Figs. 1 and 2 indicate that this could be done with little trouble.

The tests shown were made with integrating wattmeters connected to read the active and reactive kilowatts and the time of each operation and stop period between operations taken by stop watches.

It will be noted that the average kilowatt input to the 1½-hp., 1,200-r.p.m. motor is nearly 22 per cent greater than that of the 1-hp., 1,200-r.p.m. motor on the same load and the average input to the 1½-hp. motor is not an overload for a 1-hp. motor, but in spite of this the 1-hp., 40-deg. C. motor tried did not give satisfactory operation on account of its tendency to stall. However, 1 kva. in static correction corrected the average power factor to 81 per cent on the 1-hp. motor, while to obtain the same power factor on the 1½-hp. motor it required 2 kva., or just double. A 1½-hp., 1,200 r.p.m. wound rotor 50 deg. C. motor was tried and found to give better than 90 per cent power factor with 1½ kva. in static condensers and to carry the load in a satisfactory manner.

The use of these motors on the fifty machines to be installed would eliminate the necessity of the group

TABLE III—LOAD AND POWER FACTOR FOR KNITTING MACHINE AFTER CORRECTION

Test No.	Motor Hp.	R.p.m.	Drive	Test, Kw.	Per Cent of F. L.	Test, Reac. Kva.	Cond. Kva. Cap.	Time in Min.	Per Cent P. F.	Mach. Work.	Ave. No. Mach. Running	Total Mach. on Motor
				First Floor, Mill No. 1:								
1	10	1,200	Chain	6.48	75.61	2.75	1.00	10	92	21	18*	23
				Second Floor, Mill No. 1:								
2	7½	1,200	Chain	3.868	60.15	1.745	1.50	10	91.15	16	12	17
				Third Floor, Mill No. 1:								
3	10	1 200	Chain	5.15	60.09	2.95	1.50	10	86.77	19	14	20
				First Floor, Mill No. 2:								
4	7½	1,200	Chain	5.64	87.7	2.15	1.50	10	93.44	18	15	18
				Second Floor, Mill No. 2:								
5	7½	1,200	Chain	4.06	63.14	1.776	2.00	10	91.63	15	12	16
				Third Floor, Mill No. 2:								
6	7½	1,200	Chain	5.66	88.02	1.553	2.00	10	96.44	18	16	18
				32.118		14.469	9.50		91.18	107	87	112

*Line shaft for this floor also operates the building freight elevator.

condenser capacity originally figured for this load and for this reason motors with characteristics as good as these have been specified on the machine order. The matter was taken up with the manufacturers, and they have developed a new motor which they will guarantee to give 92 per cent power factor with 1.5 kva. in condensers. Exact details of the design are not yet available except that it will be a 40-deg. motor. Installation of this motor on the above-mentioned fifty machines, plus 10 kva. in correction on the two elevator motors, will entirely eliminate the necessity of any group correction.

One of the outstanding features that has in itself justified the use of individual condensers in our case has been that it has shown up bad motor applications that would not otherwise have been discovered. The power savings from this alone have been greater than the total estimated saving due to power factor correction alone as originally estimated.

There is also apparently an increased production on the individually driven full-fashioned hosiery machine due to the steadier drive apparently caused by the effect of the condensers in steadying the voltage at the terminals of the motors.

Electrical Industry in 1930

Authors of the Six Ranking Papers in the Recent Bonbright Prize Awards Contest Make Strikingly Similar Predictions

BY CHARLES E. NEAL
North American Company

A STUDY of the first six papers in the recent Bonbright Prize Awards Contest presents some very interesting information on the probable future growth of the industry. For comparing the various estimates the accompanying tabulations have been made.

These estimates indicate that the total generator rating of the industry on December 31, 1929, will total approximately 27,728,000 kw. Estimates of the five papers on generator rating range from 23,200,000 kw. to 31,800,000 kw.

The energy generated by the public utility companies of the country, which includes electric railways, reclamation service plants and some isolated plants as well as the electric light and power industry, will probably total 88,308,000,000 kw.-hr. in 1929.

The computed ratio of generator output to the annual potential capacity output shows considerable variation. The five estimates made resulted in factors from 35.19 per cent to 44.29 per cent, with an average of 36.27 per cent. The generator output per capita of these six papers ranges from 671 kw.-hr. to 773 kw.-hr., the average being 742 kw.-hr. These figures are based upon an estimated population of 119,154,156 in 1929.

The total estimated customers range from 20,092,000 to 27,500,000, the average figure being 22,832,400.

	Capacity, Kw.	Generated Output, Million Kw.-Hr.	Capacity, Factor, Per Cent	Generated Output per Capita, Kw.-Hr.
1902	1,212,235	2,507	24.9	32
1907	2,709,225	5,862	24.7	67
1912	5,165,439	11,569	25.6	122
1917	8,994,407	25,438	32.3	249
1922	14,313,438	40,291	32.1	369
1929				
Paper 1	(a)	89,280	.....	749
2	25,319,000	81,020	36.53	671
3	31,280,000	87,550	35.51	734
4	29,840,000	92,000	35.19	773
5	23,200,000	90,000	44.29	755
6	29,000,000	90,000	35.43	755
Average	(b) 27,728,000	88,308	(b) 36.27	744

(a) Not estimated.
(b) Average of five papers.

	Total Customers as of Dec. 31	Output per Customer, Kw.-Hr.	Customers per 100 Families
1902	584,000	4,293	3
1907	1,946,979	3,000	10
1912	3,837,518	2,760	18
1917	7,178,703	3,540	31
1922	12,709,868	3,170	51
1929			
Paper 1	21,270,000	4,200	76
2	20,092,000	4,030	72
3	22,500,000	3,200	80
4	(a)	.....	.....
5	27,500,000	3,270	98
6	22,800,000	3,950	81
Average	(b) 22,832,400	(b) 3,830	(b) 81

(a) Not estimated; lighting customers estimated at 22,220,000.
(b) Average of five papers.

	Capital Invested, Millions	Gross Revenue, Millions	Investment per Dollar of Gross Revenue	Average Revenue per Kw.-Hr. Generated, Cents
1902	$504	$86	$5.89	3.42
1907	1,096	176	6.25	2.99
1912	2,175	302	7.18	2.61
1917	3,060	526	5.82	2.07
1922	4,465	1,072	4.16	2.68
1929				
Paper 1	9,700	2,000	4.85	2.24
2	9,860	1,939	5.08	2.39
3	10,200	2,120	4.81	2.42
4	9,800	2,150	4.56	2.34
5	12,000	3,080	3.89	3.42
6	9,450	2,100	4.50	2.33
Average	$10,168	$2,231	$4.56	2.51

The aggregate capital invested in the industry shows a wide range, extending from $9,450,000,000 to $12,000,000,000, the average being $10,168,000,000. One paper made an estimate of $8,604,000,000 as the value of plant and equipment on December 31, 1929.

The gross revenue also shows a very large range, the lowest figure being $1,939,380,000 and the highest being $3,080,000,000, the average being $2,231,500,000. The relation between the aggregate capitalization and the gross revenue ranges from $3.89 to $5.08, the average being $4.56. The average revenue per kilowatt-hours generated ranges from 2.24 cents to 3.42 cents, against an average of 2.51 cents. The accompanying tabulation shows the actual figures in each instance from 1902 to 1922 as given by the various papers. The authors and their corresponding designation are as follows: (1) David Cowan, Montreal, Canada; (2) Robert M. Davis, New York, N. Y.; (3) John Dockendorf, Milwaukee, Wis.; (4) Reuben B. Sleight, Minneapolis, Minn.; (5) Arthur R. Stubbs and Charles H. Churchill, Jr., Schenectady, N. Y.; (6) Charles E. Neal and Chase Donaldson, New York.

Letters from Our Readers

Kw. or Kva.?

To the Editor of the ELECTRICAL WORLD:

In your editorial of August 1 entitled "Kva. Versus Kw. as Basis for Rating" no mention is made of the general public in discussing the relative merits of these units in rating alternating-current equipment.

Of course there can be no objection to the use of the kilovolt-ampere (kva.) in technical literature by engineers or others who desire to employ the term for greater precision. But, after years of struggle and educational effort, the kilowatt (kw.) is perhaps now familiar to a considerable portion of the public as an electrical unit. The older unit "horsepower" is no doubt still more familiar to the average man in the street, but to very many, especially of the younger generation, the kilowatt has come to be understood as a readily recognized electrical measuring stick. This is especially true of the kilowatt-hour which is used on millions of monthly bills of electricity supply companies and is basically interwoven with modern industry.

The public is, of course, all-important to sellers of electricity and hence to engineers and manufacturers. It is desirable, certainly, that the terminology employed should not be misleading. Therefore, I wonder if some "standard kilowatt," so to speak, could not be adopted for use in popular and semi-technical writings. based in the case of alternating-current ratings on an assumed or basic power factor.

As you say, "kilowatt" and "kilovolt-ampere" are equivalent in direct-current ratings. This adds another element of confusion in the public mind. In dealing with the public we should not put too much stress on the mysteries of electricity and the intricacies of electrical engineering, but rather dwell on the unrivaled practical benefits of this burden bearer in the service of mankind. So it seems to me that, in popular literature, the terms "kilowatt" and "kilowatt-hour" should be retained, the former being "standardized" in some way so as to be sufficiently accurate for general purposes.

WILLIAM E. KEILY.

Chicago, Ill

Central Station and Industrial Practice

Indication of Energized Circuits

BY W. J. DUCEY
Electrical Engineering Department,
Commonwealth Power Corporation, Jackson, Mich.

TO GUARD against hazards to life, service and equipment, due to failure properly to handle energized conductors or due to ignorance of the fact that they are energized, some companies have installed indicators on station conductors to give continuous indication of their being energized, and others are using portable indicators for this purpose. These indicators are of two general types—namely, gas-filled tubes and electroscopes. Some investigations have been conducted by the Commonwealth Power Corporation of Michigan in order to determine which of these types of indicators is the more desirable.

Tests with a portable neon gas-filled tube showed that it can be used as an indicator from 440 volts up. At the lowest voltage it is necessary to place one terminal of the tube in actual contact with the live conductor; on higher voltages, this is not necessary, as on 2,500 volts a good indication is obtained with the indicator held 4 in. from the conductor; the operating distance increases with the voltage to approximately 4 ft. at 44,000 volts.

The electroscope type of indicator appeared to be somewhat more sensitive than the neon tube, but was not quite so reliable in its indication, as it was subject to stray fields and static.

The manufacturer of the neon tube suggested that its sensitivity could be increased by grounding the end of the tube away from the conductor, and for this purpose a copper grounding clamp was supplied. For the higher voltages the manufacturer also supplied a square copper plate for attaching to the tube; this was designed to act as one plate of a condenser to ground. In general, however, the tests showed that the tube would indicate just as well without either of these grounding devices and would give a good positive glow when entirely ungrounded. This, of course, removes the chief objection to placing a grounded device close to a live conductor for test purposes and permits the test man to apply the tube with absolute safety to himself and the equipment.

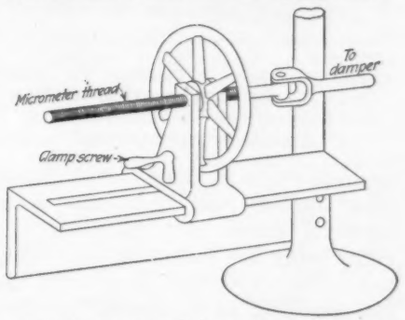
Where desired, these neon tubes or electroscopes may be permanently installed in the station in actual contact with live conductors, the other end of the tube being free except for its capacity connection to a suitable ground.

Where permanent and economical indication of the energized condition of a conductor is desirable, this method should prove attractive. It is felt, however, that the chief field for these devices is their use as a secondary means of portable voltage detectors, the best and most reliable, of course, being the use of a potential transformer and voltmeter. Both the gas-filled tubes and electroscopes are relatively inexpensive, however, and when the operators, repairmen, and construction crew are thoroughly instructed in their use they should prove a valuable accessory.

Micrometer Control for Windbox Damper

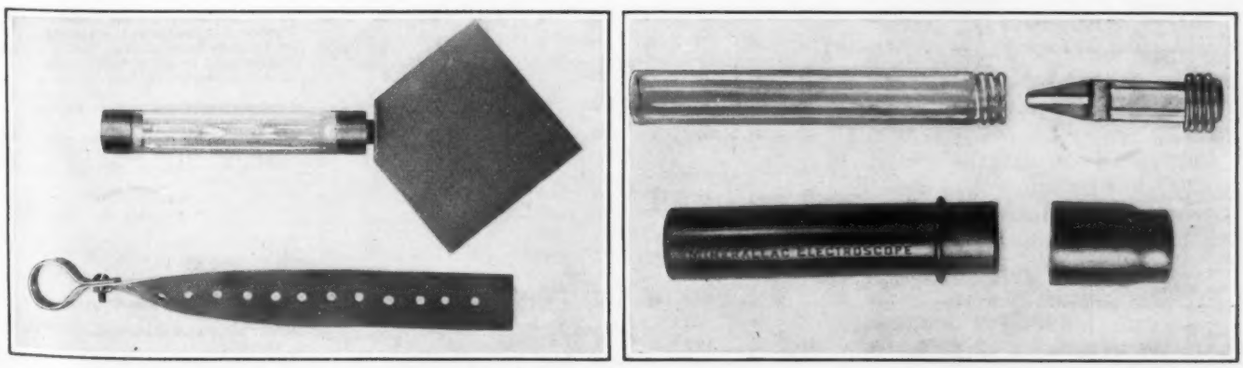
BY W. G. SHURGAR
Superintendent of Power Stations, Arkansas Central Power Company,
Little Rock, Ark.

SOME stokers are very sensitive to windbox pressure. Such is the characteristic of stokers used by the Arkansas Central Power Company. Hence there has been developed a micrometer control that is placed directly in front of the boilers within convenient reach of the operators.



ARRANGEMENT FOR CONTROLLING STOKER WINDBOX PRESSURE

It consists essentially of a Hayes hand-damper control adapted to a slide so the dampers can be closed and still brought back quickly to the same position. As indicated by the accompanying illustration, the slide consists of a slotted angle iron attached to a pedestal under the coal hopper. Sliding along the horizontal face of the angle iron containing the slot is the carriage carrying the hand-wheel engaging the threaded rod attached to the dampers. By

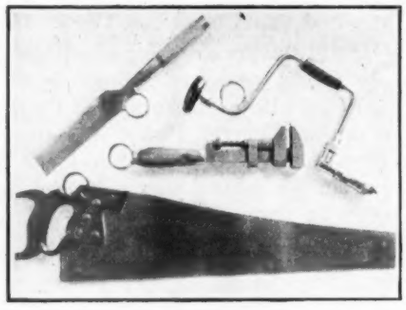


AT LEFT, HIGH-VOLTAGE INDICATOR WITH BRASS PLATE FOR AIR COUPLING AND GROUND CLAMP FOR METALLIC COUPLING.
AT RIGHT, POCKET TYPE ELECTROSCOPE

clamping the handscrew passing through the handwheel carriage and slot in the angle iron, the dampers can be set at any desired position and then be more finely adjusted by turning the handwheel.

Improved Fastening of Tools on Hand Lines

TO FACILITATE the fastening of certain linemen's tools to hand lines, the overhead lines department of the Detroit Edison Company has attached 1½-in. black enameled



HARNESS RINGS ATTACHED TO HAND TOOLS AFFORD SAFE CARRYING OF TOOLS ON HAND LINES. COURTESY DETROIT EDISON "SYNCHROSCOPE"

harness rings to these tools. These rings replace boat snaps that were formerly wired onto the tools, the rings being less bulky and less likely to interfere with the operation of the tool but just as convenient for the linemen.

Transmission Requirements for Farm Machinery

INCREASE in use of electricity by individual farmers depends chiefly upon the ease of applying electric motive power to farm equipment, once a rate structure is devised that will attract business and recompense the electric service company. If the proper speed reduction is not used between the motor and driven machinery, the desired results will not be secured. For expediency, belt transmission has been used so far, but seldom at the most economical speeds and often with considerable inconvenience due to the delay in lining up the belt and maintaining the desirable tension. Although the belt will undoubtedly be retained for many speed reductions, opportunities are offered for development of other or modified means of transmission that will facilitate attachment of portable motors and provision of desirable speed relations without great loss in efficiency.

To enable the selection of proper horsepower rating and pulley sizes for driving certain farm equipment with motors, the John Deere Plow Works of Deere & Company, Moline, Ill., has prepared the accompanying table. It will be noted that the desired speed of the machine-drive shaft is indicated in most instances with the pulley diameter and face dimensions necessary on the motor and machine shafts using 1,800-r.p.m. or 1,200-r.p.m. motors. Remarks on the relative position of the motor and on transmission requirements are also included.

Electric Furnaces Raise Steel Production

BY REPLACING a 1½-ton single-phase arc type steel furnace of obsolete design with a 1½-ton three-phase Moore Electro-Melt, the Crucible Steel Casting Company of Milwaukee has been able to raise production 50 per cent. This new furnace, installed in January, 1924, has been producing from four to five heats per day with an average energy consumption of 600 kw.-hr., according to A. C. Lange, president. After operating about fourteen years with an electric furnace, the experience had been so successful that when another type of furnace was needed in order to increase production, no other type than the electric was considered.

With this new three-phase furnace, with a transformer capacity of 800 kva., the power factor ranges between 80 and 85 per cent, which is much higher than with the old single-phase furnace. An acid lining is used built up of silica brick bound together with ganister made of a high-grade silica. This lining

PULLEY AND HORSEPOWER REQUIREMENTS FOR FARM MOTORS

	Horsepower Required	Speed of Machine Driveshaft	Motor Pulley 1,800 R.P.M. Motor Dia.	Motor Face	Motor Pulley 1,200 R.P.M. Motor Dia.	Motor Face	Machine Pulley With 1,800 R.P.M. Motor Dia.	Face	Bore	Machine Pulley With 1,200 R.P.M. Motor Dia.	Face	Bore	Remarks
Corn Shellers, Spring Type:													
No. 1, hand, one hole, 10 to 20 bu. per hour	¼	300	2½	1½			15	3		10	3		Pulley bolted to balance wheel.
No. 2, hand, two hole, 25 to 35 bu. per hour	½	300	3½	2½			21	3	1 3/16	14	4	1 3/16	
No. 2½, power, two hole, 50 to 90 bu. per hour	10	750	7	5½	8	6½	17	6	1 3/16	13	6	1 3/16	Feeder must be set at right angle.
No. 3, power, two hole, 90 to 150 bu. per hour	10	750	7	5½	8	6½	17	6	1 3/16	13	6	1 3/16	Feeder must be set at right angle.
No. 103, power, four hole, 150 to 250 bu. per hour	10	735	7	5½	8	6½	17	8	1 3/16	13	8	1 3/16	Feeder must be set at right angle.
No. 104, power, six hole, 250 to 350 bu. per hour	10	735	7	5½	8	6½	17	8	1 3/16	13	8	1 3/16	15 hp. necessary if drag feeder is used. Feeder must be set at right angle.
Corn Shellers, Cylinder Type:													
No. 5, power, 75 to 150 bu. per hour	10	500	7	5½	8	6½	25	7	1 3/16	20	7	1 3/16	Feeder must be set at right angle.
No. 9, power, 200 to 400 bu. per hour	16 to 18 20	750	8	6½	8	7½	19	8	1 1/16	13	8	1 1/16	25 hp. necessary if drag feeder is used. Feeder must be set at right angle.
No. 1, power, 300 to 600 bu. per hour	16 to 20 20	635	8	6½	8	7½	22	8	1 1/16	15	8	1 1/16	30 hp. necessary if drag feeder is used. Feeder must be set at right angle.
No. 2, power, 600 to 1,100 bu. per hour	20 to 24 25	635	8	6½	10	7½	22	8	1 1/16	19	8	1 1/16	35 hp. necessary if drag feeder is used.
No. 3, power, 800 to 1,500 bu. per hour	24 to 28 30	635	8	7½	10	7½	22	10	2½	19	10	2½	Feeder must be set at right angle.
Elevators:													
Inside cup	5		4½	4½	5½	5	40			27			Drive through regular line shaft with sprockets or with special jackshaft and same sprockets or through No. 809 speedjack.
Steel portable	5		4½	4½	5½	5	16			11			No. 821 belt attachment used.
Tubular	5		4½	4½	5½	5	14			10			Jackshaft and sprocket drive furnished.
Hay Presses:													
J. D. Dain, Junior	5	740	4½	4½	5½	5	11			9			Motor mounted on machine.
J. D. Dain, Large	10	740	7	5½	8	6½	17			13			Motor mounted on machine.
Letz Feed Grinders:													
No. 109X, 12 to 50 bu. per hour	10	400 to 750	7	5½	8	6½	32 to 17		1 3/16	24 to 13		1 3/16	Motor placed on skids and staked to ground.
No. 6, 6 to 25 bu. per hour	5	500 to 850	4½	4½	5½	5	10 to 17	4	1½	13 to 8	4	1½	Motor placed on skids and staked to ground.
Cream separator	¼												Motor mounted on machine. Optional equipment at present.
Handy mixer	1	200	3½	2½	4½	3½	10		1½	10		1½	Jackshaft necessary.

has a life ranging between 175 to 200 pours, depending upon operating temperatures and speed of production. The roof is of the ring type, being built up of a bridge made on a form and then lowered over the furnace. This roof has a life averaging around 390 pours.

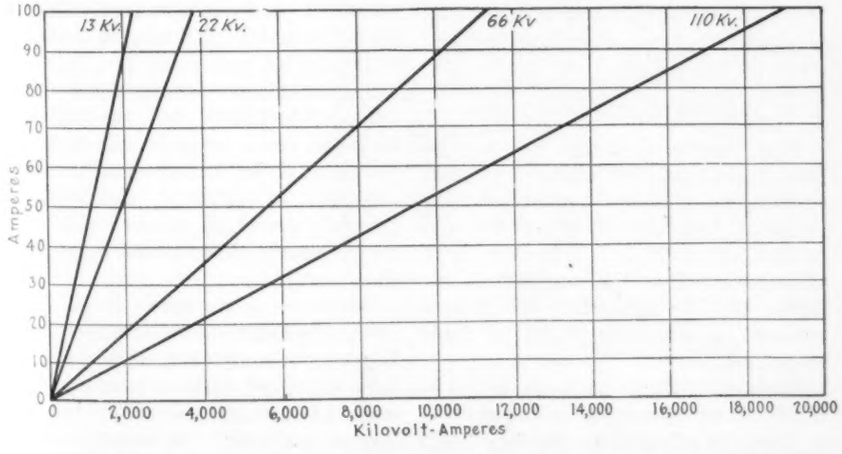
The company's product is used for sawmill machinery, traveling crane castings and blank gears. The raw material used consists of boiler plate, drop forging, shop scraps and punching, melted at temperatures around 3,200 deg. F. The carbon content of this steel varies between 0.20 to 0.30 per cent. At this temperature the electrode consumption varies between 12 and 18 lb. per ton, depending upon the rate of the meltage, the former figure being obtained when high production is obtained.

The electrical control apparatus is standard equipment normally furnished with such installations. This furnace cost completed about $30,000, which includes the furnace ready to operate with a lining installed. Had not the old substation been sufficient to provide capacity, an additional expense of $2,000 would have been incurred. This company, acting as a jobbing shop for steel production, is very enthusiastic over the use of the electric furnace, since it not only increased production but improved the control in turning out uniform products.

Graph Assists Load Dispatchers

BY C. P. CONEY
Load Dispatcher New England Power Company

A GRAPH based on the conventional formula, kva. = 1.73 *IE* ÷ 1,000, is used by the load dispatcher of the New England Power Company system to ascertain readily and quickly kilovolt-ampere values when the ampere load and voltage are known. The curves are laid out for the four voltages most in use on the New England system, but the graph could be laid out for any voltages desired.



CURVES FROM WHICH KILOVOLT-AMPERE VALUES CAN BE QUICKLY DETERMINED

Conductor Joints for Underground Cables

Design and Construction of Joints for Subway Work and Their Importance in Relation to Completed Joint

BY C. G. WATSON
Bridgeport, Conn.

MUCH attention has been paid during recent years to the design of the insulation of cable joints, and many improvements have been effected therein; but generally the connection of the conductors remains practically unchanged. That such is the case is perhaps to be accounted for by the fact that faults in cable joints commonly result in complete destruction of both cable and joint at the point of trouble, so that is is impossible to determine the cause of the breakdown. Usually, however, it is assumed that faulty insulation is responsible, although it is equally possible that faulty connection of conductors has been the source of the trouble. Thus, the insertion of conductors of two 1,000,000-circ.mil cables into a connector 2 in. long and sweating by simply pouring over a ladleful of melted solder, none of which has penetrated to the interior of the connector, can result only in failure if the cable so jointed is loaded to anything approaching its full capacity. In fact, it is the writer's experience that badly designed connectors and badly soldered joints have been the cause of many breakdowns.

Many methods of joining conductors have been practiced, but the one commonly used, because of the comparative ease with which it can be made, is that whereby the conductor ends are slipped into a metal tube, the connector, and the whole consolidated by the pouring in of hot melted solder. Nevertheless, the design and soldering of connector joints need more care than is often given to them. The connector metal should be carefully chosen, and the nearer such metal approaches in character that of the conductors to be jointed the better will be the result. Preferably, connectors should be made of copper tube, drawn approximately to size and finished in the lathe.

In order to avoid overheating, the connector should possess at least the conductivity of the conductors to be joined. Therefore, in calculating the diameter of the connector, allowance should be made for the difference of conductivity between the connector metal and the cable conductor. This allowance is considerable in the case of the alloys sometimes used, but in the case of drawn copper, such as is here advocated, the allowance is needless. However, for the sake of example, the allowance will be made in the following formulas.

Neglecting the contact between the conductor ends within the connector, the cross-sectional area of the metal in the connector should be RA, where R is the ratio between the conductivity of copper and that of the connector metal, and A the cross-sectional area of the cable conductor. The outside diameter will be $\sqrt{RA + d}$, A being expressed in circular mils, and d being the over-all diameter of the stranded conductor in mils plus 5. This five mils is the maximum play to be allowed between the conductor and the inside of the connector wall, although the inside diameter of the connector should be so near as working limits allow the same as the over all of the stranded conductor.

Assuming 100 amp. per square inch

as the safe current density for soldered contacts, taking C as the maximum current to be carried, and again neglecting contact between conductor ends, the length of the connector should be $2C \div 100 \times 3.14 \times d$.

To permit of the proper flow of solder into the joint, a slot, or a row of holes, one-eighth of an inch wide and extending to within half an inch of each end, should pierce the wall of the connector; the loss of conductivity which this slot entails can be balanced against the increase obtained by contact between the conductor ends.

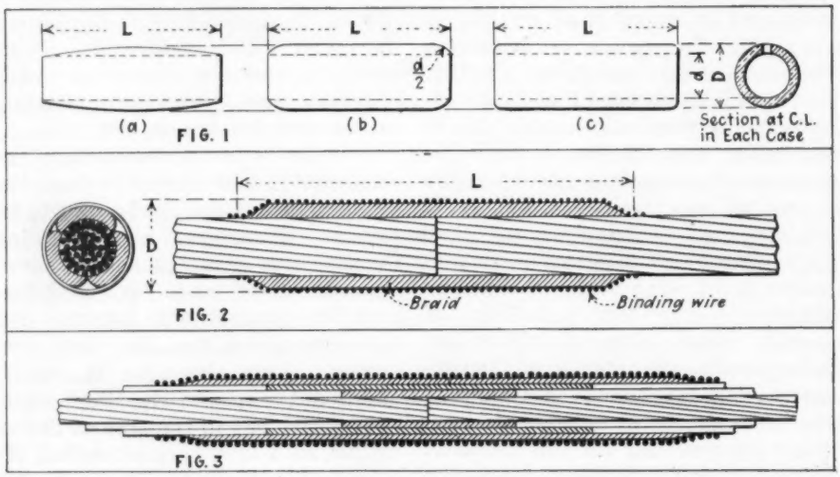
HIGH-TENSION JOINTS

In high-tension joints, where it is important that no detail should be neglected that will conduce to the best result, advantage should be taken of our present knowledge of the incidence of dielectric stresses, and the length of the connector rounded by a full curve; but in low-tension joints such rounding is needless, although all rough edges should be removed in order to prevent injury to those who have to handle the connectors. In medium-pressure joints, where the expense involved in machining the connectors to the full curve is not so needful as in the higher-pressure joints, the connector ends may be rounded to a radius not less than that of the conductor upon which they are used. This permissible case is illustrated in Fig. 1*a*, while the other cases are shown in Figs. 1*b* and 1*c*.

The following (see table above) are the chief dimensions of copper connectors designed in accord with the method described:

Area of Stranded Conductors	Assumed Maximum Current in Amp.	d in Mils	D in Mils	L in Inches
0 A.W.G.....	200	373	500	3.4
3/0 A.W.G...	270	470	630	3.7
250,000 C.M..	350	575	770	3.9
400,000 C.M..	500	728	970	4.4
750,000 C.M..	800	998	1,330	5.1
1,000,000 C.M.	1,000	1,152	1,530	5.5

For red brass having a conductivity two-thirds that of copper, the over-all diameter D should be increased 10 per cent in each case. These figures apply to circular stranded conductors, but for delta conductors the diameters should be slightly larger owing to the difficulty of rounding the conductors on the site in order to make them enter the connector. Because of that difficulty, it is preferable to have connectors for delta conductors shaped and bored so that they fit neatly over the conductors. Such connectors are more costly to manufacture than circular sectioned connectors, but they insure a sounder joint and save time in its making. However, both expensive connector and the difficulty of rounding the conductor can be avoided by using the method about to be described.



METHODS OF MAKING CABLE JOINTS

BRAID CABLE JOINTS

The tensile strength of a connector joint of the length needed to suffice for electrical considerations is much less than that of the unbroken conductor. Therefore in situations where the conductors are likely to be subjected to tensile stresses, a stronger form of joint is desirable.

Such situations occur more commonly than is usually recognized—in fact, in all cables carrying loads which vary from day to day expansion and contraction of the conductors take place, especially in large low-tension cables carrying heavy currents. There is also expansion and contraction due to seasonal variations of temperature. That the internal stresses set up in cable conductors by temperature variations are negligible is not the experience of the writer. In fact, many cases have come under his notice in which undoubted movement of the conductors in the interior of connectors in joints has occurred, cases even in which the conductor has completely left the connector.

When cables are installed in subways the manholes of which provide for bends in the cables therein, the expansion and contraction due to temperature changes are taken up by the bends; but in cases where long, straight lengths are installed, consideration should be given to the stresses likely to be set up in the conductors by heating and cooling of the cable. The rupture of the joint by such stresses can be overcome by the use of a married joint which can be made as strong as the conductor, and can nearly be overcome by a telescope joint; but both forms are difficult to make and have been discarded by cable installers.

HIGH TENSILE STRENGTH JOINT

To meet the need for a joint having high tensile strength as well as high conductivity, Charles Vernier invented the braid joint. This joint is illustrated in Fig. 2. It consists of strips of woven copper braids of fine gage wire laid lengthwise on to the conductors to be joined, tightly and closely bound by a layer of copper binding wire over their entire length, and the whole soldered solid. The flexible braids compress very closely into all the crevices of the stranded conductors so that copper to copper contact is large, so much so that a joint made in this way and left unsoldered requires the exertion of considerable force to pull out. Further, oval, delta or circular conductors can be joined equally well in this way, as the braid readily adapts itself to the shape of the conductors, which retain their shape throughout the joint.

Soldered joints made in this way have a tensile strength approximating very closely that of the conductors so joined, up to a cross-sectional area of 250,000 circ.mil; but for larger conductors, in order to obtain similar tensile strength, the joint

should be made as shown in Fig. 3, from which it will be seen that each layer of wire in the strand is stepped back and the spaces so formed filled with braids which are finally bound and soldered as before. This second type of braid joint, applied to both large and small conductors, is particularly well suited for mining work where soldering is prohibited, for the joint can remain unsoldered and still retain good conductivity.

CONSTRUCTION OF BRAID JOINT

A satisfactory braid joint is made as follows: The ends of the two conductors to be joined are separately soldered solid and butted. While still hot from the soldering, a little solder is poured over the butt and the conductors wiped clean. This soldering of the butt is not essential, but it keeps the conductors in place during the subsequent binding. Lengthwise across the butt, strips of braid of the proper weight and length are laid, held in position by a couple of binders, and lightly tapped until their edges meet around the circumference and their ends slope gently to the conductor. Tinned copper binding wire of suitable gage is now wrapped tightly, closely and evenly along the entire length, beginning on the conductor at one end and finishing on the conductor at the other end. Then hot solder is poured over the whole until it is seen to run freely through the joint, after which cooler metal is poured on until the joint is solid. Any blobs remaining are wiped off as described for the case of a connector joint. The flux and the solder should be as already noted. The dimensions of a few sizes of this type of joint are tabulated above.

DIMENSIONS OF BRAID JOINT WITH THREE SIZES OF WIRE

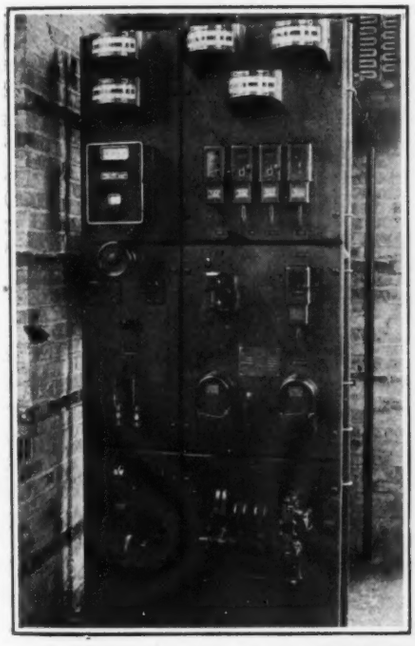
Stranded Conductor Area	Approx. Weight of Braid in Lbs. per Ft.	Number of Braids	Binding Wire, A.W.G.	Length of Joint in Inches	Over-all Diam. with Circular Conductor, in Mils
0 A.W.G.....	0.08	3	20	3	650
3/0 A.W.G....	0.12	3	20	3.5	780
250,000 C.M...	0.18	3	18	4	950

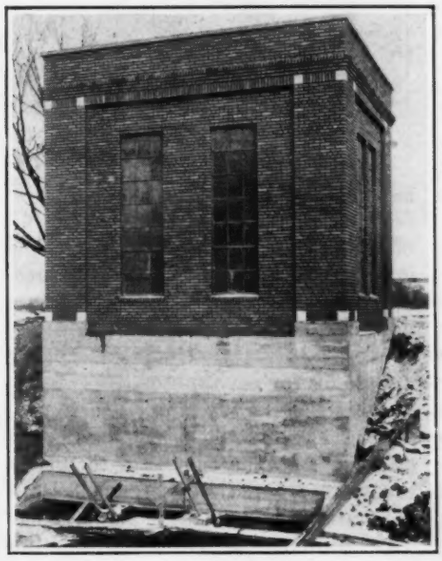
For larger conductors, suitable combinations of the three weights of braid given above can be made, arranged as shown in Fig. 3, so that in no case will the over-all diameter of the jointed conductors exceed that of the bare strand by more than 400 mils, while the length of the joint will vary according to the size of the conductor.

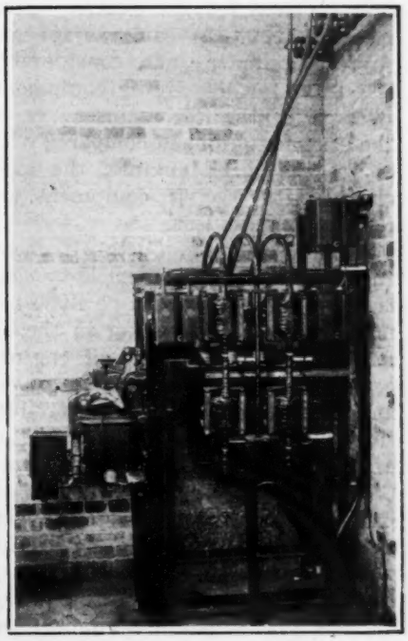
Because of its advantages, the braid joint is to be preferred for the jointing of delta conductors in all cases, and for the jointing of circular conductors where tensile stresses are likely to be a source of trouble.

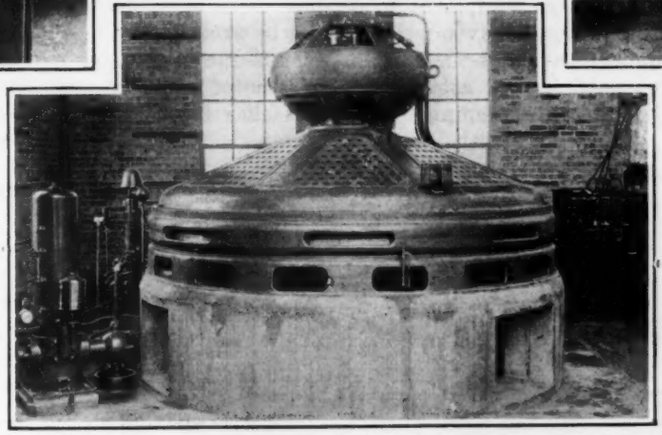
Automatic Hydro-Electric Generating Station

AN AUTOMATICALLY controlled generating station has been installed by the Michigan Gas & Electric Company on the Portage River at Three Rivers, Mich.









AUTOMATIC GENERATING STATION INSTALLED BY THE MICHIGAN GAS & ELECTRIC LIGHT COMPANY ON THE PORTAGE RIVER

This automatic hydro-electric plant starts and stops of its own accord and ceases to operate in event of any trouble. In event of low water, failure of governor oil pressure, over-speed, under-speed or hot bearings, the machine automatically drops off the lines. The plant has been operated successfully for several months. It is designed for use only on small streams where the power obtained does not justify a large operating expense.

The relay control panel is shown at the left, while at the right is one of the automatic oil switches. In the center are exterior and interior views.

Commercial Activities and Public Relations

Economies of Pumping Oil Electrically

Lower Fixed Charges—Lower Operating Cost—Greater Production May Pay All Electric Costs

BY S. G. GASSAWAY
Assistant Manager Commercial Department, Oklahoma Gas & Electric Company

THE economic reasons behind the rapidly increasing use of electricity for oil well pumping are: (1) lower fixed charges; (2) lower operating charges; (3) increased production, compared with either oil or steam engine pumping.

Fixed Charges—The installation cost per well for the electric equipment is about the same as for gas engine equipment and considerably less than for oil engine equipment. Because of the low maintenance of the electric equipment compared with either gas or oil engines, the fixed charges for electric equipment are correspondingly less.

Lower Operating Costs—If cheap fuel were a serious obstacle to electric power, there would be little use made of electric pumping in the oil fields. If gasoline and oil engines could compete with electric power anywhere, it would be in the production and refining of oil. It will be of interest, therefore, to inquire into the actual operating experience of oil producers who have used oil, steam and motor driven pumping equipment. Accurate figures, Table I, are reported by one company operating various types of power equipment, including 526 electric pumping outfits. The figures are the monthly average costs over five months.

It will be noted that the advantage of the electric motor is found in the lower labor and maintenance charges. One company reports an average monthly repair and lubrication expense of $54.04 for each gas engine and $5.50 for each motor.

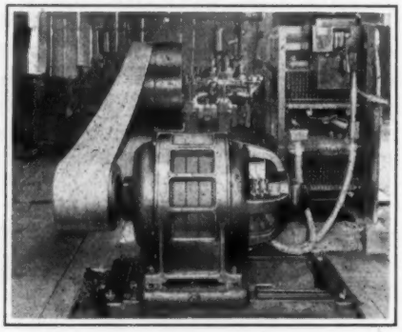


FIG. 2.—MOTOR-DRIVEN SLUSH PUMPS FOR ROTARY DRILLING
Note arrangement of duplicate pumps and sliding base for moving motor.

Increased Production—When producing as valuable a commodity as oil, any methods that lead to an increase in production with no increase in overhead are of first importance. The ability of electric pumping equipment to produce more oil from a given well than can be produced by other means is perhaps the strongest argument in favor of electric pumping. A specific case is of interest.

In December, 1918, an operator pumping eight wells with engines was induced to change seven of them to electric equipment. Some of the wells were as much as six years old. The total production of this group of wells for various periods is shown in Table II.

The value of the increased production for one year at present prices was more than $196,000. During this period the operating costs were actually lower than before electric motors were adopted. The power bill amounted to $5,500 for the year. The investment in electric outfits amounted to $16,000. Charging off the entire investment in one year, this operator increased his net profit by more than $170,000 through the use of electric pumping. To have secured the same increase in production by drilling three new wells (and assuming all three to be producers) would have cost no less than $180,000.

WHY ELECTRIC PUMPING PRODUCES MORE OIL

Experiences of operators point to the following causes of increased production with electric pumping: Fewer shut-downs due to motor troubles; fewer shut-downs due to breakage of belts and rigs; less breakage and unscrewing of pump rods; more even motion of pump rod; uniform rate of pumping yields more oil; less "whipping" or "spring" of rods; no shut-downs from frozen water lines; no stopping on center, requiring a gang of men to help on

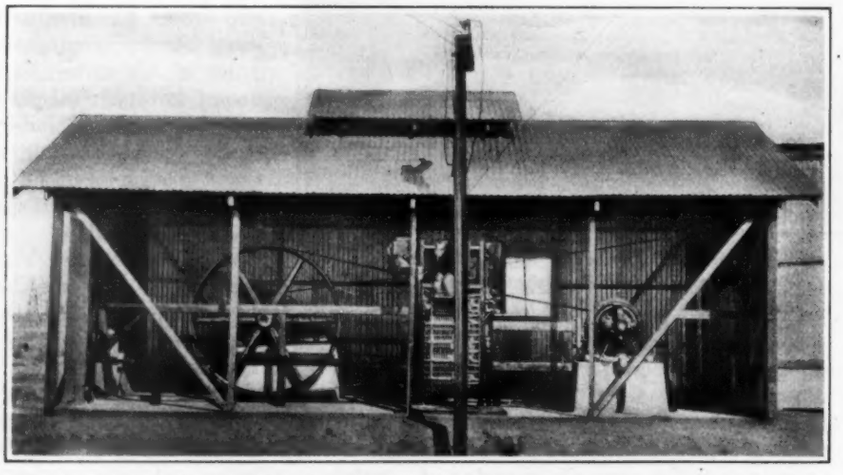


FIG. 1.—TYPICAL ARRANGEMENT OF COMPLETE MOTOR PUMPING INSTALLATION

TABLE I—COMPARISON OF ACTUAL OPERATING COSTS OF OIL WELL PUMPING

Item	Electric Motor	Gas Engine	Steam Engine
Labor for oiling	$8.60	$22.65	$22.50
Repairing	2.90	19.72	5.28
Hauling	2.51	6.22	3.09
Oil lubrication .	.32	6.71	1.55
Supplies	2.12	6.49	1.81
Power	28.84	4.71	139.23
	$45.29	$66.50	$173.46

TABLE II—INCREASED PRODUCTION WITH ELECTRIC PUMPING

Period	Production, Bbl.	Increase, Bbl.
January, 1918 — engine drive	30,408	.....
December, 1918—motor drive	37,309	6,901
January, 1919—motor drive	39,343	8,935
Year of 1918	250,088	.....
Year of 1919	381,636	131,548

flywheel; no shut-downs from runaway engines and exploded flywheels.

Also, after making money for their owners during the useful life of the wells, electric pumping outfits yield a greater salvage value than any other oil field equipment.

Plans for Sale of 20,000 Kitchen Lighting Units

IN CONNECTION with the load-building program of the Pacific Gas & Electric Company described in ELECTRICAL WORLD for July 11, page 77, this company plans to sell 20,000 kitchen units during the next six months. The campaign will have two features new to such activities. First, salesmen will sell lamps for general household use as well as the kitchen unit. Advantage is being taken of the experience of other central stations that have found that where a kitchen unit only is sold about 10 per cent of the calls made result in sales, whereas where light bulbs have been sold as well, a sale of some kind is made in about 40 per cent of the cases. Second, no trial period will be allowed and sales will not be subject to cancellation.

Dealers will have an opportunity to act as sales agents and participate in the campaign. They will be able to sell on the same basis as the power company—that is, $7.50 on time, less 10 per cent for cash, no down payment and seventy-five cents per month on the customer's lighting bill until the unit is paid for. The dealer will receive $1 commission and if he installs the unit, he will be paid an additional $1 for installation.

Salesmen employed by the company will work strictly on a commission basis. They will follow meter routes, and a crew of installers will make installations the same day as far as possible, but in any event not more than twelve hours after the sale has been made. Installation work will be turned over to local electrical dealers. Terms to the consumer are the same regardless of whether a dealer sells the unit or the power company's representative sells it. Light globes purchased by consumers will be billed on the next regular monthly bill following the date of purchase.

Survey of Appliance and Lighting Load

New York Edison Company's Study of 144,503 Premises Reveals High Degree of Satisfaction on the Part of Customers and Indicates Field for Development

OF A TOTAL of 144,503 premises surveyed by the New York Edison Company's bureau of surveys and maintenance, 95,805 customers were using, all told, 155,565 electric appliances. The figures have been compiled with a view to determining the present degree of saturation of the principal devices and also ascertaining the possibilities of future development of the appliance and lighting load in the home.

The accompanying chart visualizes a cross-section of the use of electrical appliances in two of the principal boroughs of New York City—Manhattan and the Bronx. As might naturally be expected, the electric flatiron is the most popular of the appliances, 88,034 being in use in the territory surveyed. The flatiron represents 56.6 per cent of all the appliances found and is used by 61.1 per cent of the customers. The percentage of the total and the percentage of customers using each electrical appliance is shown in detail in Table I.

TABLE I—ANALYSIS OF APPLIANCES USED IN 144,503 APARTMENTS AND RESIDENCES IN NEW YORK CITY

	Manhattan		Bronx		Manhattan and Bronx		Per Cent of Customers Using Each Appliance
	Number	Per Cent of Total	Number	Per Cent of Total	Number	Per Cent of Total	
Irons	57,952	52.2	30,082	67.6	88,034	56.6	61.1
Vacuum cleaners	20,195	18.2	8,252	18.6	28,447	18.3	19.7
Toasters	8,922	8.0	2,564	5.8	11,486	7.4	7.9
Percolators	2,946	2.6	651	1.5	3,597	2.3	2.5
Heaters	3,951	3.5	360	0.8	4,311	2.8	2.9
Grills and stoves	2,583	2.3	161	0.4	2,744	1.8	1.9
Fans	4,443	4.0	411	0.9	4,854	3.1	3.4
Curling irons	1,192	1.1	178	0.4	1,370	0.9	0.9
Washing machines	674	0.6	146	0.3	820	0.5	0.6
Sewing machines	955	0.9	213	0.5	1,168	0.8	0.8
Vibrators	582	0.5	98	0.2	680	0.4	0.4
Heating pads	478	0.4	44	0.1	522	0.3	0.3
Miscellaneous	6,218	5.7	1,314	2.9	7,532	4.8	4.9
Total	111,091	100.0	44,474	100.0	155,565	100.0	.....

The survey also shows that 66.3 per cent of the customers are using electrical appliances, while 33.7 per cent have none, and the average use per apartment or residence is 1.07 appliances. As the maximum degree of saturation, that of electric irons, is only 61.1 per cent, the company feels that there remain remarkably large possibilities for future sales of electrical appliances and development of the residential load.

Coincidentally with its study of the use of appliances the New York Edison Company also made a survey of the number of empty lamp sockets in customers' premises. The results of this study, shown in Table II, led the company to make a special analysis of about fifteen hundred customers to uncover the reasons for the presence of empty sockets, which

ANALYSIS OF 155,565 APPLIANCES USED BY 144,503 CUSTOMERS

are given in detail in Table III. Only 9 per cent of the total number of sockets installed were found to be without lamps.

It will be seen that the two most common reasons for empty sockets are the substitution of one larger-sized lamp for two or more smaller ones and plain oversight on the part of the consumer. The use of larger-wattage lamps not only results in glare and an uneven distribution of light but also cuts down the connected wattage. Whereas the average size of lamps used in the home ranges from 40 watts to 50 watts, a study of the cases where a lamp of larger wattage was used and one or more sockets left empty shows this figure to be only 32 watts (in the fixture or room in which the substitution was made). In connection with this study of the empty-socket situation one fact is very significant. Of the 832 premises having empty sockets, only 102, or 12 per cent, kept a

reserve supply of lamps on hand. such a condition appears to be the chief contributing cause for the presence of empty sockets.

"While it is, of course, most desirable to have every socket filled," said Arthur Williams, vice-president in charge of commercial relations of the New York Edison Company, in discussing these analyses, "we also realize that that would be an ideal condition practically impossible of attainment. Even under the old conditions of free lamp renewals, at least 5 per cent of the lamp sockets were empty, and, despite all the company could do, we could not reduce that figure. Now we have 9 per cent of empty sockets, but only 12.5 per cent of these are intentionally kept in this state to reduce the size of the bills. The principal causes are oversight on the part of customers in buying lamps and the replacement of two or more lamps with larger wattage. We expect to improve this condition by educating our customers to maintain a reserve supply of lamps.

"An interesting and encouraging sidelight developing from the studies we are making is what we have called our 'good-will survey,' in which we have endeavored to uncover and correct silent complaints—that is, dissatisfaction of customers who may be harboring a grievance but never tell the company about it. From a total of 43,556 customers interviewed we virtually solicited complaints. Only 1,854, or 4.3 per cent, raised any question of dissatisfaction with the company or its service. These we have tabulated (Table II), and we are making an especial effort to remedy any misunderstandings or faults of our own. We don't want many complaints and feel that this record is fairly good, but we do welcome the opportunity to satisfy a customer, and it keeps the company from becoming too complacently sure of the quality of its service."

Power Company Shows Its Interest in the Public Good

HELP
PREVENT
FIRES
BEST
WATER
PREVENT
FIRES!
NOTICE TO DRIVERS AND OTHER MEMBERS
OF THE COPCO ORGANIZATION
One of the most important things we can do is to prevent forest fires from occurring in the sections of the country in which we travel. By using the receptacle provided in this car for matches, cigarette stubs, cigar stubs and ashes, you will be doing your part to prevent such fires. It is against the law in Oregon to throw matches, lighted tobacco, cigars, cigarettes or any lighted material from vehicles along the highway. It should be our policy to observe the same rule in California and other states that we are required by law to observe in Oregon.

THE California-Oregon Power Company goes outside the purely electrical field to improve its public relations, as shown by the illustrations. The stickers shown are used on all power company cars as part of a campaign to cut down the costly destruction of the giant forest fires. The fountain appeals particularly to travelers and fosters a friendly feeling for both the company and the territory it serves.

Cement Plant Shut-Downs Cut with Purchased Power

CEMENT PLANT LOADS are not always easily obtained by central stations and the determining factor in favor of purchased power varies between different plants. In the case of the German-American Portland Cement Works, now the Alpha Cement Works, at LaSalle, Ill., the factor that most influenced the operators of the plant to purchase power was the record of interruptions of central-station service compared with the shut-down of the customer's private plant. This record, extending over four years, during which time the customer purchased part of his requirements, showed a ratio of three to one in favor of the central-station service and was so convincing that the customer closed down his private generating equipment and purchased all his power.

COMPARISON OF TIME LOST BECAUSE OF POWER FAILURE

Year	Service from Central Station		Service from Private Plant	
	Hr.	Min.	Hr.	Min.
First	38	20	50	30
Second	110	06	389	45
Third	63	00	75	50
Fourth	16	25	139	25
Total	227	51	655	30

This record of relative shut-downs due to private plant and purchased power service was instrumental in giving the entire cement plant load to the central station.

TABLE II—EMPTY SOCKETS IN RESIDENTIAL CUSTOMERS' PREMISES

	Manhattan	Bronx	Manhattan and Bronx
Premises surveyed	104,850	39,653	144,503
Total number of sockets	1,972,227	524,311	2,496,538
Average number of sockets	19	13	17
Premises with burned-out lamps	7,979	4,090	12,069
Per cent of total	7.6	10.3	8.4
Number of burned-out lamps	14,026	6,009	20,035
Per cent of total	0.7	1.1	0.8
Premises with empty sockets	55,225	22,024	77,249
Per cent of total	52.7	55.5	53.5
Number of empty sockets	159,057	52,187	211,244
Per cent of total	8.1	10.0	8.5
Premises with receptacles	29,462	10,340	39,802
Per cent of total	28.1	26.0	27.5
Number of receptacles	133,707	25,677	159,384
Premises with appliances	63,974	31,831	95,805
Per cent of total	61.0	80.3	66.3
Number of appliances	111,091	44,474	155,565
"Good Will" Survey			
Number of consumers interviewed	31,140	12,416	43,556
Number of consumers entirely satisfied with our service	29,611	12,091	41,702 *
Number of consumers who raised some questions as below	1,529	325	1,854 †
High bills and rates	800	258	1,058
Flickering lights	348	28	376
Miscellaneous	381	39	420

* 95.7 per cent. † 4.3 per cent.

TABLE III—ANALYSIS OF REASONS FOR PRESENCE OF EMPTY SOCKETS

	Number	Per Cent of Totals
Apartments and residences surveyed	1,506	....
Apartments and residences having empty sockets	832	55.2
Total number of sockets	22,536	....
Number of empty sockets	2,032	9.0
832 apartments and residences with empty sockets:		
Sockets kept empty for use of appliances	69	8.4
Empty sockets due to borrowing of lamps from sockets where it was felt that the lamps were not needed in order to replace burned-out lamps in rooms with only one or two sockets	77	9.2
Sockets kept empty because it was felt that the room had sufficient light without filling all the sockets	99	11.9
Sockets kept empty to keep down the size of the bills	104	12.5
Sockets empty due to replacing two or more lamps with a single lamp of greater wattage	240	28.8
Sockets kept empty through plain oversight; *i.e.* burned-out lamps removed but not replaced	243	29.2

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Design of Steam-Power Plants for Economy.—JAMES A. POWELL.—In view of an apparent tendency to strive for higher efficiency and greater fuel economy in the design of power plants and central stations than can be justified when the increased capital or fixed charges are considered, the author presents an economic analysis to test the justification of increased expenditures for the various elements of the steam plant. He presents data and curves based in the main on prices and guarantees received from manufacturers in connection with a 180,000-kw. plant recently designed. Studies are included of the relative economy of different stages of feed-water heating, of type of boiler and size of economizer, of relation between return on increment investment and efficiency of boiler and economizer, and of the most economical size of condenser. The conclusion is reached that under conditions which he specifies, and which would seem to be representative for a large central station, pressures above 400 lb. and operating results below 16,000 B.t.u. are too expensive and are not sound business propositions.—*Power Plant Engineering*, June 15, 1925.

Hydro-Electric Power Supply for Vienna.—J. SCHLÖGL.—This article describes in a general way the hydro-electric power system supplying the Austrian capital, in addition to the two steam plants within the city itself. There are at present three water-power stations tied into a network, transmitting three-phase, 50-cycle current at 110 kv. into Vienna, with a total transmission-line length of 140 miles. A fourth station is nearing completion. The author goes into great detail, describing one of the typical outdoor receiving stations and the erection of the main transmission lines, which use steel-aluminum cables. Radio communication over the transmission wires gives excellent telephonic connection between all the main stations and substations on the system.—*Elektrotechnik und Maschinenbau*, June 28, 1925.

Morkfoss - Solbergsfoss Hydraulic Power Station in Norway.—GEORG BROCHMANN.—This article gives a technical description, as well as a historical review, of water-power development in Norway. The Solbergsfoss station will have thirteen vertical Francis turbines aggregating a maximum output of 11,000 kva. at 10,500 volts. Seven of these turbines will be in operation this fall, the remainder to be added later.—*Teknisk Ukeblad*, July 17, 1925.

Generation, Control, Switching and Protection

Hydrogen as a Cooling Medium for Electrical Machinery.—E. KNOWLTON, C. W. RICE and E. H. FREIBURGHOUSE.—The paper presents the results of theoretical study and numerous tests on a generator fitted with an experimental closed-circuit cooling system in which hydrogen was circulated. Definite conclusions reached are: (1) For the same operating temperature a steam turbine-driven generator of a given size will have a capacity at least 30 per cent greater when operated in hydrogen than when operated in air; (2) the efficiency will be 1 per cent or more higher; (3) there will be no danger of fire destroying the insulation; (4) the determinal effects of corona, if present, will be greatly reduced; (5) the machine may be protected by suitable devices from the formation of an explosive mixture of hydrogen and air; (6) the frame can be made sufficiently strong to resist an explosion; (7) the cooler may be considerably smaller than a cooler for removing heat from air.—*Journal of A. I. E. E.*, July, 1925.

The Oil Circuit Breaker from an Operator's Viewpoint.—E. C. STONE.—This paper is abstracted at length in the ELECTRICAL WORLD, July 11, 1925, on page 57.—*Journal A. I. E. E.*, July, 1925.

Comparison Between Steam and Diesel Plants.—F. OHLMÜLLER.—The National Electric Light Association made and published recently an elaborate comparison between a steam-turbine-driven plant and a Diesel-motor plant, both with a capacity of 7,500 kw. The author utilizes the data of this comparison and makes a similar comparison for German conditions. He finds that American prices are about double the German prices. The difference in current cost between steam plant and Diesel plant is in Germany greater on account of dearer oil. Lower steam and oil consumption for both prime movers of German manufacture give higher efficiencies. German machines of essentially the same type as the American machines in the original paper have been assumed so that the study is primarily a comparison between American and German conditions rather than an absolute comparison between a steam plant and a Diesel plant.—*Elektrotechnische Zeitschrift*, July 9, 1925.

Transmission, Substations and Distribution

Reliability of Electric Power Transmission.—J. BIERMANNS.—In large and extended power systems the question of continuity of service is today of paramount importance. Reliability of all installed apparatus is now as much sought after as are electrical and mechanical efficiencies. In the article under notice the author reviews the various machines and apparatus which are parts of a power system, mentions the nature of failures to which they may be subjected and indicates their most up-to-date types. Short circuits are always accompanied by excessive mechanical forces which busbars and cables have to withstand. Their supports must be strong enough to hold several tons of pressure for every meter length, or else they must be placed far enough apart to weaken the effect. Power transformers must be made, and can readily be made, short-circuit-proof. Oil switches for highest rupturing capacity must be installed in places where large amounts of energy may have to be broken in an emergency. Manufacturers of both transformers and oil switches are expected to test these apparatus under actual short-circuit conditions. Great attention must be paid to the use of proper oil in transformers and switches and to the maintenance of this oil in good condition. Oil should be changed every three years and in breakers after every heavy short circuit. The Petersen coil has proved very successful in coping with arcing grounds. Of ten such troubles, nine on the average are diverted by this apparatus on lines up to 60 kv. To limit excessive short-circuit energies in less important branch lines the use of current-limiting reactors is recommended. A large number of faults on the lines can be limited or localized by the choice and installation of the proper kind of relay. Several of these are described in detail, to explain the exact purpose for which they are designed.—*Elektrotechnische Zeitschrift*, June 18 and 25, 1925.

Voltage Regulation of Three-phase Transmission Lines.—H. COTTON.—This paper brings together in convenient form several well-known methods, approximate and exact, for computing line regulation. They include the T and Π methods—in which connection the formulas given by Kennelly are quoted for adjusted values of impedance and admittance to give the regulation accurately—and the solution by hyperbolic functions. The derivation of the equations used in the latter is shown. Each method is illustrated by a numerical problem worked out in full. The author has included the computation of corona loss with the aid of Peek's formula.—*World Power*, July, 1925.

Units, Measurements and Instruments

Measuring Dielectric Absorption.—RALPH E. MARBURY.—An abstract of this paper may be found in the report of the annual convention of the A. I. E. E. in the ELECTRICAL WORLD, July 4, 1925, on page 17.—*Journal of A. I. E. E.*, July, 1925.

Porosity Tests on Porcelain.—R. PFEIFFER.—It has been customary to determine porosity of electrical porcelain by applying upon a freshly broken insulator a small amount of a methylated fuchsine solution and observing whether this red liquid penetrates into the porcelain. Modern ceramic methods produce, however, a porcelain of such high density that in many cases this test fails to disclose pores. For this reason the author has developed a fuchsine testing method applied under very high hydrostatic pressure. The test pieces are placed in a strongly built chamber, filled with the fuchsine solution, and a pressure of up to 4,400 lb. per square inch is applied. The pressure is left on from ten to thirty hours, after which time it is seen that porce-

lain pieces which were found by the usual method not to absorb fuchsine show a distinct penetration. Only the very best porcelain will test negatively with this method.—*Elektrotechnische Zeitschrift*, July 16, 1925.

Illumination

Illumination Design Data for Industrial and Commercial Interiors.—This is a revision of an earlier bulletin under a slightly different title. It describes the "lumen method" and gives a variety of data required for the intelligent design of an indoor lighting installation, among them the very convenient set of perforated color strips with which specialists in illumination have become familiar for determining the reflection coefficient of a surface by matching it against a sample. Additional items have been introduced in the table of present standards of foot-candle illumination, some of them calling for extremely high intensities formerly considered out of the range of possibility, as for the elimination of daylight window reflections (200 to 1,000 foot-candles), and a few of the older figures have been raised, but otherwise the levels are the same as those regarded as good practice four years ago.— *Bulletin 41-B, Engineering Department, National Lamp Works.*

Motors and Control

Development of Low-Starting-Current Induction Motors.—P. L. ALGER.—The ability to secure high starting torque without an excessive starting current in the case of the slip-ring motor and the much lower cost of a squirrel-cage motor of the same power rating have created a perpetual struggle between the two types. A review of the progress in design, which includes descriptions and in some instances characteristic curves of such machines as the Gorges, the Zani, the motor which has a centrifugally controlled resistance mounted within the rotor, the Punga and others, leads to a discussion of the double squirrel-cage machine in which a secondary winding of relatively high resistance and low inductance is placed in parallel with one of high inductance and low resistance. The theory of the double squirrel cage is taken up under various cases, and equations are developed connecting the equivalent starting resistance and the several cage resistances and reactances. A comparison of the starting characteristics thus obtainable with those of a normal motor is given. When the value of starting torque is unimportant, so long as it is at least 75 per cent of full-load torque, a high-reactance rotor having a single cage with idle steel bars in the slots can be used.—*General Electric Review*, July, 1925.

Heat Applications and Material Handling

Manufacture of Pure Tungsten.—G. A. PERCIVAL.—Remarking that it is not the shape but the quality of tungsten which makes a good ignition contact and that the same consideration applies to other uses, the author of this paper describes the various forms of treatment—chemical, electrical, and mechanical—required to carry the metal through from ore to finished filament. The information is very specific—for instance, as to such matters as temperatures, duration of treatment, current and voltage, and the effects on the finished product of faulty procedure. —*World Power*, July, 1925.

Caloric and Electric Tests on Flatirons. — K. BACKHAUS. — This paper represents one of the most elaborate articles ever published on the subject treated. Flatirons from ten different manufacturers are minutely described, measured and tested. All thermal and electrical data are given in tabulations and curves. Temperatures were measured with embedded thermocouples, and the heat output was determined with a specially devised calorimeter. In a theoretical part of the paper the author describes a method of calculating the efficiency of electric flatirons to permit a caloric comparison between the performance of various makes.—*Der Elektrische Betrieb*, June 10 and July 10, 1925.

Electrophysics, Electrochemistry and Batteries

Unipolarity of Corona.—M. G. EVREINOV.—The article contains a short description of the author's demonstration of the unipolarity of the corona. The corona has an essentially cathodic character. If the corona-bearing wire is placed between two plates symmetrically, a galvanometer connected to the plates shows no current. When the wire is nearer to one plate a current is indicated, changing its sign when the wire approaches the other plate. Four experiments of a similar kind are described. An alternating current of a high-tension transformer may be rectified by use of the corona. The direct current obtained in this way has not yet exceeded a fraction of a milliampere. Some theoretical speculations as to the explanation of the phenomenon are given.—*Electrichestvo* (*Russia*) No. 5, 1925.

Traction

"Asynchronous Coupling" and Its Application to Diesel-Electric Locomotives.—J. STETZOOLA.—With the construction of Diesel-electric locomotives for Russian railways the establishment of a better method of transmission from one shaft to another, with a changing coefficient of transmission, is becoming more and more necessary. The author's method consists of the use of the so-called "asynchronous coupling" connected in cascade with a three-phase commutator motor with series excitation. The article contains theoretical explanations and calculations. *Electrichestvo* (*Russia*), No. 5, 1925.

Staten Island Electrification.—Data on rolling stock, power supply, substations, signal system and other features regarding the recently completed electrification of the Staten Island (N. Y.) Rapid Transit Railway, a subsidiary of the Baltimore & Ohio, are given in two substantially similar articles. Primary power at 33,000 volts, three-phase, 60 cycles, is purchased and supplied to five substations with an aggregate installation of 10,000 kw., four of them automatic, the other semi-automatic. The successive steps in the automatic operation, which is started when the third-rail voltage drops to a predetermined minimum, are described as well as the provisions for protecting apparatus in service. A given temperature rise in the first converter in a substation causes the second to be started. There are ninety motor cars, taking power from contact rails at 600 volts. Trains are of the multiple-unit type. Provision is made for dynamic breaking in case power is cut off.—*Railway Age*, July 4, and *Railway Review*, July 11, 1925.

Telegraphy, Telephony, Radio and Signals

Production of Single Sideband for Transatlantic Radio Telephony.—R. A. HEISING.—The paper describes the equipment and circuits used in the production of the single sideband for transatlantic radio telephony in the experiments at Rocky Point, Long Island. The description is preceded by a review of the method of eliminating one sideband and the carrier frequency after modulation. In practice this is more readily accomplished if the carrier frequency is comparatively low. The single sideband thus obtained, which is of the same range as the speech frequency but higher on the frequency scale, is then used to modulate a second carrier. Three groups of frequencies result—the second carrier, a lower sideband and an upper sideband. These groups are far removed from one another. The desired group, which may be either sideband, though the lower is actually selected, is readily passed through a broad band filter, which nevertheless stops the others. Moreover, the range which can be given to this filter makes it possible to vary the transmission frequency by merely changing the second carrier. In the paper the actual values are given, with impedance charts of the filters and schematic diagrams.—*Proceedings of the Institute of Radio Engineers*, June, 1925.

Regulations for Outdoor Aërials in Germany.—G. W. O. HOWE.—Under the general caption "Notes on Wireless Matters," the author quotes regulations which have been drawn up by a commission of the Verband Deutscher Elektrotechniker for the erection of aërials for the reception of broadcasting. These are to be incorporated in the regulations issued by the various municipal authorities, and since the installations they are intended to control are in the vast majority of cases put up by amateurs, the detailed and technical requirements of the specifications are noteworthy. These include the designation of permissible standard materials and wire sizes, of given tensile strength; calculation of sag at two stated temperatures and loadings, to meet a specified factor of safety of three, and various rules as to erection for mechanical and electrical safety and for neat appearance of the antenna, which, in fact, must so far as possible be so arranged as to be invisible from the street.—*Electrician* (*England*), July 10, 1925.

News of the Industry

World Power Men Meet

International Committee Talks of Rome for 1930 Conference — To Establish Journal

DISCUSSION of the form of permanent organization, determination of conditions under which regional meetings could be held and trial publication of a journal were the three principal matters that came up for discussion at the meeting in London, July 27, of the international executive committee of the World Power Conference.

Twenty countries were represented at the meeting. While no decision was arrived at as to the time and place for holding the next world conference, the consensus of opinion apparently was favorable to a meeting in 1930. The invitation of Italy has priority. If conditions at that time are comparable to those now existing, it is probable the conference will go to Rome, but the executive committee would not allow itself to be committed thus far in advance. Although the committee was unable to accept the invitation of Switzerland to call another world conference at Basle next year, provision was made for sectional meetings. A meeting of the European section will be called at Basle, and the international executive committee will meet there next year. This was satisfactory to the Swiss and will take care of similar situations when there is a demand for a conference in any one of the grand geographical divisions.

In submitting a form of permanent organization, the executive committee emphasized the desire to safeguard the conference in every way against becoming a superorganization. The whole desire is to work out a plan whereby the central organization will be the creature of the national committees.

It was regarded as so necessary to the attainment of the objectives of the conference to have a publication that it was decided to publish the *Journal of the World Power Conference* for one year, to give it a trial. During this trial period all expense of the effort will be borne by the British national committee.

Muscle Shoals Steam-Power Plant in Full Operation

For the first time since 1921, when its lease to the Alabama Power Company began, the steam-power installation of United States Nitrate Plant No. 2 is operating at full capacity. Heretofore it has operated at varying capacities but not until now, to relieve the shortage of hydro-electric power caused by the severe drought of the early summer, has it been called upon for its full output of 60,000 kw. This power is being turned into the interconnected system of the Alabama Power Company to feed North Carolina, South Carolina, Alabama and Georgia. Under the terms of the lease the United States receives a revenue of approximately $2,500 per day during the period of capacity operation of the plant.

Drought Necessitates Load Curtailment in Georgia

The long-continued drought in the Southeast has made it necessary for the Georgia Railway & Power Company to notify its large industrial customers of its inability to carry the industrial loads between the hours of 6 a.m. and 6 p.m. The ability to obtain additional power from the steam plants of neighboring power companies at night and the operation of its own steam plants will make it possible for the company to supply industrial power between the hours of 6 p.m. and 6 a.m., thus providing for a continuation of industrial activities through the change in hours of operation of the mills. The small manufacturing establishments, commercial establishments, hotels, office buildings and similar customers have not as yet received notification of compulsory curtailment, but have been appealed to through the press to be sparing in the use of electric service between the hours of 6 a.m. and 6 p.m.

The Central Georgia Power Company is also finding it necessary to curtail power supply to its large customers, and the Augusta-Aiken Railway & Electric Corporation has been short of power for some weeks past.

Death Comes to Sir Adam Beck

Chairman of Hydro-Electric Power Commission of Ontario and Father of Provincial Generating and Distribution System Expires in Sixty-eighth Year

SIR ADAM BECK, chairman of the Hydro-Electric Power Commission of Ontario and father of the Hydro system in that province, died from pernicious anemia, at his home in London, Ontario, on Saturday, August 15, in his sixty-eighth year. He had been suffering for more than a year and had only recently returned from Baltimore, where he was for three months a patient in the Johns Hopkins Hospital, undergoing a number of operations for blood transfusion.

Sir Adam was born at Baden, Ontario, and his early education was received in Ontario institutions. In 1878 he engaged in the iron foundry and milling business with his father, the late Jacob B. Beck, at Baden. Later he developed a box-manufacturing business. He continued in this line for four years, then went to London, Ontario, where he built an extensive plant, and established branches at Montreal, Toronto and Hamilton.

HYDRO CHAIRMAN IN 1906

The beginning of Sir Adam's interest in the supply of cheap electric power to the people of Ontario was in 1903, when he was appointed a commissioner to investigate the development and distribution of electric power from Niagara Falls. His enthusiasm grew rapidly, and in 1906, as minister without portfolio in the provincial government, Sir Adam introduced a power bill in the Legislature creating the Hydro-Electric Power Commission. He was appointed chairman of the commission in June of that year. This position he continued to hold up to the time of his death.

First elected to the Ontario Legislature for London in 1902, Sir Adam was re-elected for each succeeding term until the provincial general election of 1919, when he was defeated. He was again returned by a great majority in the general election of 1923 and was appointed minister without portfolio when the present government was formed.

When the first government guarantee of Hydro bonds was demanded, Sir Adam was instructed by the then Premier, Sir James Whitney, to remember that $6,000,000 was the limit. But Sir Adam found little difficulty in getting the Whitney limit raised to hundreds of millions after he had shown the Premier what he could do. The first transmission line was built from Niagara to the switching point at Dundas, near Hamilton, and extended from there to Toronto on the north and to Berlin (now Kitchener), Guelph, Woodstock, London, St. Thomas and other cities on the west, a ring around

the interior of the province being rapidly completed. The formal opening took place in Berlin in October, 1910, on the completion of the first 100 miles of transmission line at a potential of 110,000 volts. The growth of the Ontario Hydro system until it reached its present huge dimensions is part of the history of electricity.

SETBACKS ENCOUNTERED

Sir Adam Beck's plans in Hydro affairs met with setbacks under the Drury United Farmer government, which took office in Ontario in 1919, particularly with reference to Hydro-Electric railways. A royal commission after several months of investigation, recommended against building certain radial railways under provincial guarantees and thereby took issue with the Hydro commission and its chief. This report caused a certain division between Sir Adam and the government, when the latter made it clear that it was inclined to accept the royal commission's report as the one to follow.

Then there was a break over the cost of the Chippawa project, and while the Drury government did not stop the work there, it held up the latest advance of three and a half million dollars until the Legislature could vote on it. Sir Adam defended the stand of the Hydro commission with characteristic vigor, attacked the royal commission's report and defended the Hydro commission's expenditures. He is said to have regarded the great Queenston-Chippawa plant at Niagara as the crowning success of his career.

Strongly worded replies were also forthcoming to the criticisms of the Ontario commission emanating from the United States, such as those contained in a report made by William S. Murray to the National Electric Light Association a few years ago and in the more recent Smithsonian Institution pamphlet of Samuel S. Wyer. When charges of irregularities in administration were bruited in Ontario last winter Sir Adam demanded a judicial investigation and received vindication, only charges of a trifling character which did not reflect on the integrity of the management being sustained.

Right up to his final breakdown Sir Adam was vigorously advocating by speech and pen that the Canadian government move more actively to hasten the development of power on the international section of the St. Lawrence River. He was one of the leading protagonists of the projected St. Lawrence plant at Morrisburg, Ontario, but protested strenuously against the plan to place its entire cost on the users of Hydro power.

Sir Adam had very wide interests. He was Mayor of London from 1902 to 1904. He was president of the Union of Municipalities in 1904 and held office in various other organizations. Known far and wide for his interest in thoroughbred horses, Sir Adam was a promoter of the Canadian Jockey Club and was master of the London Hunt Club. With Lady Beck he was a regular exhibitor at the New York Horse Show in the days of its glory.

During the war Sir Adam rendered valuable service to the cause of the Allies as director of remounts. He personally supervised the purchase of army horses for the Canadian forces. He was knighted in 1914.

In a statement concerning Sir Adam's death Howard Ferguson, Premier of Ontario, said:

"Sir Adam was an outstanding figure in Ontario and indeed in all Canada. It is now twenty years since Sir James Whitney launched his hydro-electric policy, which many well-meaning people in those days thought to be visionary and impracticable. Sir James Whitney insured the success of the undertaking through the wonderful organizing ability and zeal and energy of Adam Beck, who realized the value of the opportunity of placing within the reach of all the great advantages which nature and science had combined to bestow upon this community.

"The difficulties, the discouragements and the disparagements Sir Adam had to meet would have deterred any man less zealous and less energetic in the service of the public. During the greater part of his public career it was my privilege to sit in the Legislative Assembly with Sir Adam, and I had many opportunities of observing his keen watchfulness and his untiring zeal for the great project which was his life work and which will for generations to come be his monument. No man in public life ever gave himself up more fully and more effectually to a great ideal than did Sir Adam during those years."

Some idea of Sir Adam Beck's tremendous capacity for work even while fighting such a deadly malady as pernicious anemia may be obtained from a scrutiny of his activities during the time he was in South Carolina early this year in search of health, the long weeks while he was undergoing treatment in Baltimore and during the past few months since his return to Canada. While in Aiken, S. C., and even later in Baltimore, he arranged for day-to-day reports from his secretaries in London and Toronto on all matters of public interest or concern, and from his bedside he directed the management of the provincial Hydro system, receiving regular visits from F. A. Gaby, chief engineer. Since Sir Adam's return to London these visits from Hydro officials had been more frequent, and not until the coma that presaged death came upon him did he relinquish the controlling direction of the huge enterprise he had created.

The funeral service was held in the Anglican Cathedral at London, Ontario, on Tuesday, August 18, burial taking place in Hamilton, where his wife is also buried.

SUCCESSOR NOT YET NAMED

It has been rumored that Premier Ferguson may take over the chairmanship of the Ontario Hydro-Electric Power Commission and carry on Sir Adam's work, No definite announcement to this effect, however, has been made yet; but on Monday the Premier announced that F. A. Gaby, chief engineer of the Hydro-Electric Commission, had received temporary powers of a commissioner in order that the business of the commission might not be delayed or hindered through Sir Adam Beck's death, which leaves only one member—J. R. Cooke—on a board the full strength of which is three.

City Electricians Meet

Detroit Has Profitable Gathering of International Association with Good Attendance

REPRESENTATIVES of electrical departments, city electricians, inspectors and superintendents of fire-alarm and police telegraph systems and municipal plants from American, Canadian and European cities met at Detroit this week, from August 17 to 20 inclusive, at the thirtieth annual convention of the International Association of Municipal Electricians. An attendance of 148 was registered. The convention was opened by Jacob Grimm, president of the association, his remarks being followed by an address of welcome by Mayor John W. Smith of Detroit.

Outstanding features covered by the papers presented at the various sessions and in the discussions following the papers included traffic control and police and fire alarm systems. Traffic signals were the subject of a paper by Dr. M. G. Lloyd, United States Bureau of Standards. Other subjects discussed included wiring specifications, storage batteries, upkeep for fire and police systems, the characteristics of driven ground rods and municipal lighting. W. J. Canada, engineer with the National Fire Protection Association, spoke on the relationship between that association and the International Association of Municipal Electricians, pointing out the importance of co-operation in the prevention of losses by fire.

An interesting exhibit was arranged in connection with the convention in which were shown in operation automatic electric traffic signals, police signaling systems and code signaling, line materials, batteries, interior fire-alarm switches, wires and cables and traffic controls, as well as relay systems.

Wednesday afternoon was occupied by a trip to the plant of the Ford Motor Company, followed by the annual Gamewell Fire Alarm Telegraph Company dinner. Another tour of inspection was scheduled for Thursday afternoon to the Detroit police headquarters and fire-alarm central office. The Thursday session was reserved for officers' and committee reports. Entertainment for the ladies accompanying the delegates was abundant.

The following officers were elected: President, Louis Gascoigne, Detroit; vice-presidents, Ralph W. Wiley of San Francisco, George P. Allen of Jacksonville, Fla., and Charles K. Ahearn; secretary, E. H. Benz, West New York, N. J.

Maine to Vote on Exportation of Tidal Power

A special referendum election will be held in the State of Maine on September 14 to decide whether the law prohibiting the exportation of electric power outside the state shall be waived as regards any power which may be generated by the projected tidal plant on the Bay of Fundy for which Dexter P. Cooper, well-known hydraulic engineer, is sponsor. Mr. Cooper's plan is to utilize the natural upper and lower pools provided by Passamaquoddy Bay and Cobscook Bay near Eastport, at the northeastern extremity of the state, to

generate power by building at the mouth of the upper pool a wall 4,000 ft. long and 70 ft. high and provided with thirty-three gates, the mouth of the lower pool to be closed by a 2,400-ft. wall and power houses to be erected on a 3,600-ft. wall between the two pools, of which the upper one, containing 100 square miles of water, would discharge into the lower one—otherwise an empty reservoir—having a capacity of 50 square miles of water. The scheme would require the approval of the Canadian as well as the United States government and its cost is estimated at from $75,000,000 to $100,000,000 and the amount of energy that could be generated at 600,000 hp. or more.

Technical and Accounting Heads for N. E. L. A.

Chairmen of the Technical and Accounting Sections of the National Electric Light Association have been appointed, C. F. Hirshfeld of the Detroit Edison Company, accepting the former post and C. M. Breitinger of the Philadelphia Electric Company the latter. As announced last week, M. S. Sloan of the Brooklyn Edison Company has accepted reappointment as chairman of the Public Relations Section. The chairmanship of the Commercial Section has not yet been filled.

Industrial Lighting Activity Chairmen Appointed

Joseph F. Becker, chairman of the industrial lighting committee of the National Electric Light Association, has announced the appointment of geographic division chairmen for the "industrial lighting activity" as follows:

New England Division.—J. Daniels, Edison Electric Illuminating Company, Boston.
Eastern Division.—C. A. Musson, United Electric Light & Power Company, New York.
East Central Division.—H. W. Derry, Union Gas & Electric Company, Cincinnati.
Great Lakes Division.—Oliver Hogue, Commonwealth Edison Company, Chicago.
Southwestern Division—R. I. Brown, Arkansas Central Power Company, Little Rock.
Southeasterh Division.—H. B. Whiteman, Tennessee Electric Power Company, Chattanooga.
North Central Division.—H. E. Young, Northern States Power Company, Minneapolis.
Rocky Mountain Division.—C. E. Addie, Public Service Company of Colorado, Denver.
Northwest Division.—J. F. Orr, Idaho Power Company, Boise, and H. J. Gille, Puget Sound Power & Light Company, Seattle.
Pacific Coast Division.—A. M. Frost, San Joaquin Light & Power Company, Fresno.
Canadian Division.—R. H. Mather, Shawinigan Water & Power Company, Montreal.

One Unit of Moccasin Plant Now Back on Lines

Power from one unit of the Moccasin plant of San Francisco's Hetch Hetchy project was put on the lines August 14 at 4:50 p.m., with an initial capacity of 5,000 kw. This was increased later to 12,000 kw. The second unit was expected to be put in operation two or three days later and the remaining two within ten or fifteen days. The shutdown of the plant, which consists of four 20,000-kva. units, was, as previously reported, necessitated by damage to two of the penstock lines caused by an operating error on June 30.

Wisconsin's Activity

Electrical Expansion Is the Order of the Day in the Badger Commonwealth

THE activities of the North American Company and of the Wisconsin Public Service Company, which is now a Byllesby property, have been reported in recent issues of the ELECTRICAL WORLD. The latter company has acquired the Penenee Falls power site on the Menominee River near Marinette from the Spies interests of Menominee

PROJECTED MILWAUKEE-IRON MOUNTAIN LINE OF NORTH AMERICAN COMPANY.

and will hold it in reserve until increasing business calls for its development. The site comprises approximately 500 acres of land. On the same river the Northern Paper Mills Company is developing plans for the expenditure of about a million dollars at its White Rapids hydro-electric plant, 40 miles north of Marinette, where all the power for these paper mills will be generated. The initial installation will be 8,000 hp., and the ultimate capacity will probably reach 16,000 hp.

A transmission line is being built from Green Bay to this site. As far as Amberg the arms on one side of the steel towers to be erected will be occupied by the Wisconsin Gas & Electric Company's transmission line to its properties in northern Michigan. The Wisconsin Gas & Electric, which has its headquarters in Racine, is a subsidiary of the North American Company, and the Wisconsin Public Service Company is opposing in the courts condemnation proceedings for a right-of-way instituted by the Wisconsin Gas & Electric on the ground that the latter is not proceeding in good faith. The Wisconsin Gas & Electric on its part asserts that the parent company has already spent $1,300,000 on the Milwaukee-northern Michigan line and that the completion of this line is imperative to supply territory now insufficiently served by the Peninsular Power Company because of low water.

Another expanding system is that of the Beloit Water, Gas & Electric Company, which will spend about $350,000 for additions and improvements to its generating and transmission properties, according to its new manager, T. F. Keefe. The existing 5,000-kw. capacity at the company's Pleasant Street power plant is to be doubled and eventually trebled, and a transmission line will be built to Janesville to supply the Wisconsin Power & Light Company with power for distribution from there. A 66,000-kw. substation will be erected at Beloit.

The map shows the projected 250-mile, 132-kv. transmission line of the North American Company which will tie in Green Bay with Milwaukee on the south and in the other direction with the Iron Mountain district hydro-electric plants of the Peninsular Power Company on and across the northern boundary.

Safety in Hydro Plants to Be Topic at Cleveland

Safety in hydro-electric plants will form one topic of discussion at the meeting of the Public Utilities Section of the National Safety Council in Cleveland next month. This section will hold two sessions during the five-day gathering—one on Tuesday, September 29, and one on Thursday, October 1, besides a joint session with the Electric Railway Section on Wednesday, September 30. The topic already named will be discussed at the first session by Charles A. Sears, Keokuk; H. J. Burton, Jackson, Mich.; Hugh F. Lovering, Worcester, Mass., and Wills Maclachlan, Toronto.

Other topics at this session will be co-operation in safety work and safety in a plant organization, the main papers being presented by Col. Oscar H. Fogg, Consolidated Gas Company, New York, and M. C. Allen, Western Union Telegraph Company, New York, respectively. On Thursday Robert O. Bentley, Newark, N. J., will lead a discussion on "where to start safety work," other participants being S. C. Henton of Akron, W. J. Kelly of Chicago, B. L. Huff of Jackson, Mich., and W. K. Granger of Detroit, all electric utility men. A linemen's safety meeting will be held.

The value of the local council to the railway and utility, concrete results from scientific accident prevention and problems of system operation from the safety standpoint will be the topics at the joint meeting with the Electric Railway Section. Charles P. Hubbard of Detroit will present the last-named

subject, and E. F. Davies of New York, P. B. Juhnke of Chicago and H. S. Fitch of Pittsburgh will discuss it. A luncheon will be addressed by Dr. Charles H. Rust of Wilkinsburg, Pa., and City Manager W. R. Hopkins of Cleveland.

Hoover's Observations on Falls Are Misunderstood

Remarks by Secretary Hoover recently concerning the urgent need of engineering work to prevent the recession of Niagara Falls were distorted until some newspaper correspondents had him saying that "beautiful Niagara Falls is in danger of total destruction through diversion of water for electrical development." What Mr. Hoover had in mind was the need for the placing of a submerged weir or the construction of diverting islands to keep the water from concentrating on the low point of the gorge, thus gradually bringing about the "suicide" of the Horseshoe Fall. The Canadians already have done some work looking to increased diffusion on their side.

The present position of the crest was recently photographed by the army air service and the results now are being mapped by the Corps of Engineers. The map probably will be ready by September 1.

Insull Reiterates Views

But Prefers Not to Answer Specific Questions on Current Boom in Utility Stocks

INTERVIEWED regarding the significance of the wide fluctuations and phenomenal increases in some public utility holding company stock prices, the reaction which these occurrences will have on the utilities themselves and what may be done to prevent undesirable speculation, Samuel Insull, president Commonwealth Edison Company, declared a few days ago that he had nothing to say on the situation in addition to the interview widely published, of which the essential portions were printed in last week's ELECTRICAL WORLD.

For the benefit of utility companies all over the country, Mr. Insull was urged to express his views on the following questions: "What has caused the large price increases and fluctuations?" "Is not part of the increase justified by greater stability coming from the better understanding of utilities?" "How can utilities explain the present situation to the public?" "What can utilities do to protect the public from stocks which are above true value or which have fluctuated seriously without injuring all utility securities?" "Can utilities collectively stop absurd stock prices and fluctuations?" To all of these questions he refused to respond, saying that what he had not covered in the published interview holding-company executives would have to answer for themselves. He did add, however, that past market occurrences will have a serious reaction on utilities if allowed to continue, and he particularly commended H. L. Doherty for the vigilance he has practiced in minimizing speculation in his companies' stocks.

Illinois Central-Edison Company Contract

Completed Design Provides for Purchase of Central-Station Power for All Electrification Purposes—Method of Operation, Character and Extent of Load

SEVEN substations will, as reported in the ELECTRICAL WORLD for January 10 (page 98), be built and operated by the Commonwealth Edison Company to provide energy for the electrification of the terminal of the Illinois Central Railroad at Chicago and its suburban lines. With the completion of the design for this undertaking further information on the facilities to be installed is available. The Edison company will, as previously stated, supply 1,500-volt direct current and 4,000/2,300-volt, 60-cycle, three-phase energy directly to the railroad company's distribution lines. The power company will also supply alternating current at three additional points where the railroad company will provide space in its own buildings for transformers, switches, etc. All of these substations will be fed directly from the generating stations of the Commonwealth Edison Company or the Public Service Company of Northern Illinois, through which the contracting company is supplying power at substations outside the city limits of Chicago. To preclude interruption of service each substation will have two or more transmission lines for incoming power.

Negotiations with the Commonwealth Edison Company originally involved these alternatives: (1) Purchase by the railroad company of high-voltage alternating current to be delivered to substations owned and operated by the railroad company, and (2) purchase of both direct and alternating current of voltage and frequency characteristics required on the railroad distribution line through substations to be owned and operated by the power company. Taking into consideration the cost of operating the substation system, the latter arrangement was considered more economical to the railroad company, and the contract was signed on this basis.

The contract with the Commonwealth Edison Company was negotiated after the railroad company had carefully considered the practicability of constructing an independent power system including the power plant, transmission lines and substations. The higher cost of generation at such a plant, the excessive fixed charges caused by a relatively high percentage of reserve generating capacity, the lower degree of insurance against uninterrupted supply and various other factors caused this idea to be rejected.

NATURE OF THE LOAD

All the electric power required under the electrification ordinance passed by the city of Chicago on July 21, 1919, will be supplied by the Commonwealth Edison Company. The ordinance provides first for electrification of all suburban service by 1927, then for the electrification of freight service north of Roosevelt Road by 1930, including the freight yards at South Water Street, which will remove steam-engine service immediately adjacent to the Chicago "Loop" district. All major freight operations within the city limits are to be electrified by 1935, and all through-passenger service, under certain conditions, within the city limits is to be electrified by 1940.

A large proportion of the load is made up of the suburban electrification. At the present time about four-hundred suburban trains are operated per day, and a large growth of traffic is anticipated after electrification.

Power required by tenants like the Michigan Central Railroad for traction, yard, station and shop facilities, etc., will be included under the contract, subject to the approval of the Illinois Central Railroad.

YEARLY CONSUMPTION

It has been estimated that the total energy consumption during the first year of the full electric operation will be approximately 55,000,000 kw.-hr. as metered on outgoing meters at substations. Of this amount, approximately 80 per cent will be required at 1,500 volts direct current for traction purposes and the remainder for miscellaneous lighting and power uses. It is estimated that by the date established for through passenger electrification the total demand will be about double the demand for the initial year. The initial load of the railroad company is estimated to have a load factor of approximately 30 per cent, from which value it is expected to increase as the electrification program proceeds.

Total conversion equipment will consist of 33,000 kw. of capacity in rotary converters and 9,000 kw. in mercury-arc rectifiers. The rotary converters will all be 3,000-kw. sets, with two machines in series to provide 1,500 volts. The application of mercury-arc rectifiers was made and approved for the heavy loading conditions of the Illinois Central electrification after thorough investigation of their use elsewhere and with consideration of the trend of engineering development.

At certain points, approximately intermediate between substations, the railroad company will install and operate tie stations to connect distribution lines erected over each track, thus to insure better use of the installed copper. The tie station and substation feeder equipments will contain high-speed circuit breakers of 2,000 amp. continuous capacity, which will provide automatic protection for all feeders, with discrimination between short circuits and useful loads. This equipment will be controlled remotely.

Substation operation and maintenance will be handled by the Commonwealth Edison Company, and all expenses thereof will be borne by it. The power director of the railroad company may, however, give orders as to operation of feeders directly to the substation attendants, in accordance with operating rules to be issued jointly by the railroad company and the Edison company.

Commonwealth Edison Serves Chicago's Union Station

The recent formal opening of the new Chicago Union Station drew general attention to the fact that the entire electrical service in the large building had, after careful consideration by the engineers of the railroad companies that use this station, been intrusted to the Commonwealth Edison Company. Edison Service is received over three cable transmission lines operating at 12,000 volts, 60 cycles. The main switchboard and power equipment are installed in the sub-basement. Here are three 500-kw. rotary converters for supplying 230-volt direct current for general power use and small motor-generator sets for furnishing the 70-90-volt train-lighting and battery-charging service. Here, also, are transformers for supplying 115-230 volt alternating current for station lighting and 2,300-volt service for concourse and street lights. The total capacity of the apparatus installed at present is 3,900 kw., while the ultimate capacity is 4,900 kw. Power for operating the switch and signal systems is delivered to the switch towers as 2,300-volt alternating current and is transformed to 110 volts for use.

Specially designed lighting equipment has been provided to harmonize with the character of the different rooms. In the main waiting room are sixteen massive bronze pedestals in which are mounted two 250-watt lamps in reflectors and four 200-watt lamps to illumine the bowl. These standards are supplemented by two banks of floodlights, each having thirty-five 500-watt reflectors.

Program for New England Division, N. E. L. A.

For the seventeenth annual convention of the New England Division of the National Electric Light Association, to be held at the Hotel Griswold, New London, Conn., September 8-10, an excellent program has been prepared. Subject to possible changes or additions, it is as follows:

TUESDAY, SEPTEMBER 8

Evening.—General session: Address of welcome, Governor John H. Trumbull of Connecticut; president's address, F. H. Smith; greetings from N. E. L. A., President J. E. Davidson; "N. E. L. A. Activities," M. H. Aylesworth; report of committee on relation of electricity to agriculture, F. A. Belden; report of educational committee, E. S. Mansfield.

WEDNESDAY, SEPTEMBER 9

Morning.—Commercial session: Chairman's address, J. Daniels; report of Rate Bureau, A. V. S. Lindsley, discussion by C. L. Campbell and S. Ferguson; report of Power Bureau, F. K. Simmons; "Present and Future of Industrial Power in New England," Robert M. Davis, statistical editor ELECTRICAL WORLD; report of New-Business Bureau, H. J. Walton.

Afternoon.—Commercial session: Report of rural electric service committee, H. M. Parsons; "The New Hampshire Project," F. A. Belden and E. A. White; report of Lighting Bureau, F. J. Gallagher, Jr.; "The Results of the Home-Lighting Contest," J. E. Davidson; "The Industrial Lighting Campaign," J. F. Becker; "The Simplified Lamp Program," H. Schroeder; report of Appliance Bureau, R. Lincoln; "Stuffers in Bills," O. R. Underhill; "Electric Ranges," L. A. Fiorani; "Vacuum Cleaners," A. H. Allcott; "Small Appliances," C. A. Dean; "Washing Machines," R. E. Holden; "Electric Refrigeration," C. E. Greenwood; report of Transportation Bureau, E. S. Mansfield; report of Contact Committee, T. S. Knight.

Evening.—Dancing.

THURSDAY, SEPTEMBER 10

Morning.—Technical session: Chairman, J. P. McKearin; report of accident prevention committee, E. P. Noyes; "Power-Factor Correction," L. W. W. Morrow, managing editor ELECTRICAL WORLD; discussion, "Static Condensers with Relation to Power-Factor Improvement," H. Hingham, F. B. Snyder, Donald Walch, L. S. Horner and Paul B. Vallé.

Accounting session: Chairman's address, I. S. Hall; report of stub accounting plan, customers' records, C. J. Allen; report of short-cuts committee, P. M. Scott; report of insurance committee, H. P. Hood.

Afternoon.—Sports.

Evening.—Public relations session: Chairman, A. B. Lisle; "The Utility Powder Puff Versus the Utility Razor," Miss Helen E. Steiner. (Other speakers to be announced.)

Publishers Join to Cover Foreign Markets

Establishment of the Business Publishers' International Corporation to meet more adequately the demand for specialized business publications in the fields of overseas trade and industry has just been announced by the McGraw-Hill Company, Inc., and the United Publishers' Corporation, who will jointly control the new organization. Three publications already in existence form the nucleus of the new company, which will maintain editorial and business representatives in the important commercial centers abroad. The papers are *Ingeniería Internacional*, a McGraw-Hill industrial and engineering monthly circulating in Spain and Latin America; *El Automovil Americano* and the *American Automobile* (overseas edition), circulating in Europe, Australasia, South Africa and the Orient.

The new corporation is headed by Mason Britton, president, who is a vice-president of the McGraw-Hill Company. John Abbink, until the formation of the new publishing firm business manager of *Ingeniería Internacional*, is vice-president and general manager; J. L. Gilbert, who was business manager of the two automotive publications, is vice-president and secretary, and C. A. Musselman, president of the Chilton Class Journal Company, the automotive publications' division of the United Publishers' Corporation, is treasurer. The board of directors includes, in addition to the officers, Charles G. Phillips, president of the United Publishers' Corporation; Malcolm Muir, a vice-president of the McGraw-Hill Company; Philip S. Smith, editor of *Ingeniería Internacional*, and George E. Quisenberry, editor of *El Automovil Americano* and the *American Automobile* (overseas edition).

"Tremendous development is taking place in overseas trade and industry," said an officer of the corporation in its offices at 225 West Thirty-fourth Street, New York. "The demand for specialized business papers, which developed and has been met in this country, is growing in industrial and trade centers abroad. Organization of the Business Publishers' International Corporation is in response to that demand and to meet it more effectively. The corporation will follow closely the activities of the two parent companies, which are the largest in the world in their respective fields."

Excellent Outlook for Success of Camp Co-operation V

Reports from the Society for Electrical Development, which, in co-operation with the League Council, is sponsoring Camp Co-operation V, the fourth conference of electrical leagues, to be held at Association Island, Henderson Harbor, N. Y., on September 8 to 12, indicate that greater interest than ever has developed during the year in local co-operative business-building work. The business program of the conference covers quite completely those things in which electrical leagues are interested today. It is well balanced, and numbered among the subjects are those of interest to local electrical groups which are considering the formation of leagues as well as to leagues in actual operation.

When the camp gets together J. Robert Crouse, the "father of national co-operation in the electrical industry," will make the flag-raising address, and W. W. Freeman, president of the Society for Electrical Development, will deliver the address of welcome. The first actual business session will take place on Tuesday evening, September 8, and will be followed by other sessions each morning and evening thereafter. Representatives from the leagues will present papers on the various subjects and discussion will be open to all present. The afternoons will be devoted to recreation, which will include golf, tennis, boating, yachting and swimming. The main features of the business program follow:

TUESDAY, SEPTEMBER 8

Morning.—Registration of conferees; flag-raising address, J. Robert Crouse; address, W. W. Freeman.

Evening.—"Status of the Leagues Today," Earl E. Whitehorne, commercial editor, ELECTRICAL WORLD; "What the Leagues Are Doing"—presentation of league exhibits; five-minute reports by the leagues of Rhode Island, British Columbia, Rochester, Kansas City, Youngstown, Dallas, Washington, Denver, Atlanta, Seattle, northern Illinois, California, Minneapolis and Winnipeg.

WEDNESDAY, SEPTEMBER 9

Morning.—"Organizing a League," K. A. McIntyre; "Planning and Managing the League's Activities"; "Keeping League Supporters Informed."

Evening.—"The Social Side of the League's Activities: (a) Programs of Meetings, (b) Attendance and Membership, (c) League Cuttings."

THURSDAY, SEPTEMBER 10

Morning.—"Local League Work from a National Viewpoint"; report of League Council, T. C. Russell; "Local Legislation and Application": (a) "Uniform Electrical Ordinance," S. L. Nicholson; (b) "Code," W. J. Canada; "League Activities in the Industrial Field"; "Industrial Lighting Campaign."

Evening.—"Organizing the Industry for Massed Effort Nationally—The Electrical Christmas"; "What Women Want to Know About Electricity in the Home," Miss Katherine Fisher.

FRIDAY, SEPTEMBER 11

Morning.—"The Red Seal Plan," W. L. Goodwin; "Local Operation"—five-minute reports from the leagues or corresponding organizations of Syracuse, Rochester, Niagara frontier, Pittsburgh, Louisville, Detroit, Hudson Valley, Grand Rapids, California and Toronto; League Council committee reports; open questions and discussion; "Summing up of the League Conference," W. L. Goodwin.

Evening.—Banquet.

SATURDAY, SEPTEMBER 12

Morning.—Special session for league secretaries and secretary-managers.

Briefer News

Vermont Outing Postponed. — The date of the annual outing of the Vermont Electrical Association, announced last week, has been changed to September 18, so as not to conflict with the meeting of the New England Division, N. E. L. A., at New London.

Another New England Property Added to Middle West Holdings.—The Twin State Gas & Electric Company of Boston, controlled by the Middle West Utilities Company, has acquired the Jones & Linscott Electric Company of Lancaster, N. H. The transfer price is stated as $128,134.

Lake Erie (Ohio) Company Buys Bellevue Plant.—The Ohio Public Utilities Commission has authorized the sale of the Bellevue Illuminating Company, Huron County, to the Lake Erie Light & Power Company, Geneva-on-the-Lake, for $161,000. The authorization carries with it a proviso that there shall be no increase in rates or lessening in efficiency.

Tennessee Electric Building Line to McMinnville.—The Tennessee Electric Company, which took over the Walling Light & Power Company at McMinnville, Tenn., some weeks ago and has since supplied that place with light and power from the local plant, is extending its transmission lines from its Great Falls generating station at Rock Island to McMinnville, a distance of 18 miles. The work will require about sixty days.

Eighty-one Iowa Municipalities Give up Their Publicly Owned Plants.—The Iowa Light & Power Company has purchased municipally operated plants at Castana and Ricketts, Iowa, and added them to its chain. Schleswig has voted to dispose of its plant and distribution system to the same company for $45,000. A state survey shows that eighty-one Iowa municipalities have abandoned their publicly owned plants. Votes are being held elsewhere.

Antigo (Wis.) Plant Taken Over.—Ownership of the Antigo Electric Company, one of the few remaining isolated central stations in Wisconsin, has passed into the hands of the First Wisconsin Trust Company of Milwaukee through the transfer of all the stock of the company on the basis of $200 a share. The valuation of the company's property in 1921 was $241,749. It serves a community of 9,000. Extensive developments are possible.

Alabama Power Company to Spend $13,250,000 for Plant at Lock 18.—According to the estimates of the Alabama Power Company, the total investment for the installation of its initial hydroelectric development at Lock 18, near Netumpka, Ala., for which authorization has now been granted the company by the Alabama Public Service Commission, will be $13,250,000. This expenditure will provide for a 72,000-hp. plant. The ultimate installation will total 150,000 hp.

Centralia (Wash.) Property to Be Sold at Auction.—The defunct Sherman County Light & Power Company at Centralia, Wash., operating in Lewis County, will be sold at auction on September 16 to satisfy a judgment of $259,251 recently given in the Superior Court in favor of the Portland Trust & Savings Bank. The property to be sold includes a transmission line between Centralia and Chehalis.

Four More Companies Go to Middle West Utilities.—Four small Wisconsin properties have just been sold to the Middle West Utilities Company for a consideration said to be approximately $2,000,000. These companies are the Central Wisconsin Power Company of Oshkosh, the Mattoon Public Service Company, the Wittenberg Light & Power Company and the Leopolis Electric Light & Power Company, which have served a score of towns and villages in middle east Wisconsin, largely by means of purchased energy.

Spokane Has 300,000,000-Cp. Searchlamp.—A searchlamp weighing more than 2 tons and having an intensity of 300,000,000 cp. has recently been in-

stalled on the roof of the Old National Bank Building in Spokane by the Washington Water Power Company to replace a very much smaller one. It is said that the new light will be powerful enough to be seen for a radius of from 150 to 200 miles. The apparatus is of the type used for air-mail landing fields, coast defense operations and in the battery of searchlamps installed at Niagara Falls. The lamp, which is of General Electric manufacture, is about 8 ft. high and is mounted on a steel tower 220 ft. above the street.

Morgan City (La.) Plant Changes Hands. — Hugh M. and Byrnes M. Young, who have owned and operated the Morgan City (La.) electric light and ice plant for nearly a decade, are reported to have sold their interests to the Louisiana Public Utilities, Inc. The purchase price is said to approximate $250,000. W. H. Cassidy of Memphis will become manager of the plant for the new owners. The Louisiana Public Utilities had previously come into control of a number of small lighting plants in south Louisiana.

Work on Second Unit at Middletown, Pa., Begun.—Installation of the second 30,000-kw. unit of the new 200,000-kw. power station of the Metropolitan Edison Company on the Susquehanna River at Middletown, Pa., was started last week. The first unit was placed in operation early this year, and recent official tests showed that in efficiency and economy, due largely to the use of powdered fuel, it ranks very high and that it can easily produce 35,000 kw. The second unit is expected to be ready for service in March, 1926.

Southwestern Light & Power Buys Hollis Plant.—The Southwestern Light & Power Company, Oklahoma City, has purchased the power plant of the Hollis Light & Ice Company and is asking a new franchise giving the city lower rates. The sale price of the plant was not made known. The city will vote on the new franchise September 8. Under the plan 30 miles of high-tension line is to be constructed to reach the city, the old plant to be retained as a standby. Hollis is the twenty-sixth city to be served by the Southwestern lines.

Merger in South Central Illinois.—The A. E. Pierce and Thomas E. Hughes electric utilities in south central Illinois have been merged as the Illinois Public Service Company, of which Mr. Pierce will be president and Mr. Hughes vice-president. The interests of the new corporation are valued at $5,000,000, and the properties include the Homer Electric Light & Power, Bement Electric Light & Power, Lincoln Water, Light & Power, Freeport Gas & Light, Mount Pulaski Light & Gas and Bellflower Light & Power companies, supplying a score of communities with power and light. The main office of the concern will be in Chicago, but a branch will be maintained in Champaign.

New Generating Station for Braddock, Pa.—The United Electric Light Company of Wilmerding, Pa., will build a generating station at Braddock at the foot of First Street on the Monongahela River. The equipment, which will all be of Westinghouse make, will include two 3,125-kva. steam turbogenerators, and the station will cost $700,000. It will be completed in the spring of 1926, with ample room for expansion. Work on a 22,000-volt transmission line from the new power station to the United company's substation at Wilmerding will begin in September.

Pacific Gas & Electric Protests Against Supply of Energy by One Mining Company to Another.—In a complaint filed with the California Railroad Commission by the Pacific Gas & Electric Company the commission is asked to make an order denying the Utica Mining Company authority to sell electrical energy to the Calaveras Copper Company in accordance with an agreement said by the Pacific company to have been

executed last month. The Pacific company, which has been furnishing the copper company with energy, claims that the construction of the extension necessary to carry the energy from the plant of the Utica Mining Company to the mines of the Calaveras company will entail unnecessary duplication of the Pacific company's distributing system and is not necessary because of the Pacific company's willingness to continue giving service.

Indianapolis Light & Heat Company's Construction Program.—Improvements, extensions and construction work involving an expenditure of about $900,000 are being carried out by the Indianapolis Light & Heat Company. During the first five months of this year $186,108 was spent in renewing and improving power equipment and in putting new equipment into the Mill Street and Kentucky Avenue stations. The program for the last seven months calls for the expenditure of $882,639. A great part of this work consists in laying permanent underground transmission lines in the downtown district of the city.

Oakland, Cal., Seeks Lower Power Rates.—The City Council of Oakland, Cal., on August 5 instructed the city attorney to institute proceedings before the California Railroad Commission for the purpose of obtaining a reduction in the power rates charged by the Pacific Gas & Electric Company and the Great Western Power Company. Figures presented by the city attorney purported to show that the business of the companies in the East Bay district had increased 46 per cent since 1922, that the number of consumers had grown from 84,000 to 104,000 and that the percentage of increase in operating expenses had been low.

Mississippi Power & Light Buying Small Plants in Mississippi.—Purchase of the small power plant at Raymond, Miss., has been announced by the Mississippi Power & Light Company, of which H. C. Couch of Pine Bluff, Ark., is president. This acquisition, it is explained, is one of a number of similar purchases recently made or soon to be made, the plan being to feed these small places from the 110,000-volt transmission line now nearly completed from Jackson, Miss., to the company's large new steam plant at Sterlington, La. Overtures, it is said, are under way looking to the transfer of the Yazoo City plant, now municipally owned and operated.

Coming Large Hydro Installations Reach Building Stage.—Among orders for hydraulic machinery recently placed with the William Cramp & Sons Ship & Engine Building Company, Philadelphia, is one covering four 18,000-hp. units for installation by the West Virginia Power & Transmission Company of Pittsburgh on its Cheat River project in Pennsylvania. The Rumford Falls (Me.) Power Company has a 7,800-hp. unit on order with this firm, the Alabama Power Company one for a 45,000-hp. turbine for its Cherokee Bluffs plant, and for the Powell River development in British Columbia and the Shawinigan Water & Power projects in Quebec orders with the Canadian licensees of the Cramps call for 25,800-hp. and 20,000-hp. installations respectively.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 4, page 50.]

Wisconsin Utilities Association, Electric Section—Green Bay, Wis., Sept. 4-5. J. N. Cadby, 445 Washington Bldg., Madison, Wis.

Camp Co-operation V (local leagues)—Association Island, Henderson Harbor, N. Y., Sept. 8-12. (Society for Electrical Development, New York, is sponsor.)

New England Division, N. E. L. A.—Hotel Griswold, New London, Conn., Sept. 8-11. Miss O. A. Bursiel, 149 Tremont St., Boston.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 9-12. Harold A. Buch, 212 Locust St., Harrisburg, Pa.

Pennsylvania State Association of Electrical Contractors and Dealers—Hotel Jermyn, Scranton, Sept. 10. M. G. Sellers, 1202 Locust St., Philadelphia.

Rocky Mountain Division, N. E. L. A.—Hotel Colorado, Glenwood Springs, Col., Sept. 14-17. O. A. Weller, 900 15th St., Denver.

Illuminating Engineering Society—Hotel Statler, Detroit, Sept. 14-18. N. D. Macdonald, 29 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Benjamin Franklin Hotel, Philadelphia, Sept. 14-19. John F. Kelly, Empire Bldg., Pittsburgh.

American Institute of Electrical Engineers, Pacific Coast Section—Olympic Hotel, Seattle, Sept. 15-18. F. L. Hutchinson, 33 West 39th St., New York.

Great Lakes Geographic Division, N. E. L. A.—French Lick Springs, Ind., Sept. 23-26. R. V. Prather, 305 Illinois Mine Workers' Bldg., Springfield, Ill.

Association of Electragists International—West Baden, Ind., Sept. 23-25. L. W. Davis, 15 West 37th St., New York.

American Electrochemical Society—Chattanooga, Tenn., Sept. 24-26. Colin G. Fink, Columbia University, New York.

Empire State Gas and Electric Association—Lake Placid Club, N. Y., Oct. 1-2. C. H. B. Chapin, Grand Central Terminal, New York.

American Electric Railway Association—Atlantic City, N. J., Oct. 5-9. J. W. Welsh, 292 Madison Ave., New York.

National Association of Railroad and Utilities Commissioners—Washington, D. C., Oct. 13-16. J. B. Walker, 270 Madison Ave., New York.

Electric Power Club—Briarcliff Manor, N. Y., Oct. 19-22. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Association of Edison Electric Illuminating Companies—Hot Springs, Ark., Oct. 19-23. Preston S. Millar, 80th St. and East End Ave., New York.

Association of Railway Electrical Engineers—Hotel Sherman, Chicago, Oct. 20-24. J. A. Andreucetti, 413 C. & N. W. Terminal Station, Chicago.

American Welding Society—Boston, Oct. 21-23. M. M. Kelly, 29 West 39th St., New York.

Kansas Public Service Association—Topeka, Oct. 23-24. H. Lee Jones, Topeka, Kan.

Iowa State Association of Electrical Contractors and Dealers—Waterloo, Iowa, Oct. 27.

Southeastern Geographic Division, N. E. L. A.—Chattanooga, Tenn., Oct. 29-30. E. T. O'Connell, Alabama Power Co., Birmingham.

West Kootenay (B. C.) Company Starts up New Plant.—Bringing the capacity of the Bonnington Falls installations of the West Kootenay Power & Light Company to a total of 72,000 hp., the Lower Bonnington Falls plant of this British Columbia company was put on the lines August 3. Two 20,000-hp. hydro units geared directly to Canadian General Electric Company generators are installed. A third unit of similar capacity will be added when the power is needed. The opening ceremonies were attended by about five hundred business and civic leaders. The West Kootenay company serves a number of communities in the vicinity of Trail, B. C., and Northport, Wash. Power also is supplied to the smelter of the Consolidated Mining & Smelting Company of Canada at Trail and the mine and mill of the Allenby Copper Corporation near Princeton, B. C.

Scholarship Winners in Home-Lighting Contest Select Universities.—The five girls and five boys who won the university scholarships offered as prizes by the Lighting Educational Committee in the home-lighting contest conducted by it last year have selected the following universities, where they will respectively enroll, four in September of this year, one next year, one in 1927, two in 1928 and one in 1931: McGill University, Montreal; University of California, Berkeley, Cal.; Georgia State College for Women, Milledgeville, Ga.; Indiana University, Bloomington, Ind.; Oberlin College, Oberlin, Ohio; Christian College, Columbia, Mo.; Union College, Schenectady, N. Y.; Bryant & Stratford College, Buffalo, and University of Cincinnati, Cincinnati. One winner is still undecided. The winners, whose names were published in the ELECTRICAL WORLD for January 3, have selected various courses, electrical engineering being chosen by one youth, Roswell E. Brett, who will attend Union College.

New England Committee Chairmen Appointed.—Acceptances of committee chairmanships in the New England Division of the N. E. L. A. for 1925-6 have been received from the following: Commercial Section (P. J. Wilson, Lowell): Contact, T. S. Knight; appliance, G. E. Nickerson; lighting, F. C. Eteson; electric transportation, E. D. Mansfield; power, E. D. Learned; electric refrigeration, C. E. Greenwood. Technical Section (G. M. Hardy, Worcester): Prime movers, G. L. Barton; underground systems, H. A. Stanley; hydraulic power, W. D. Henderson; meter, W. J. Mowbray; inductive coordination, J. A. Vahey; overhead systems, E. E. Nelson; electrical apparatus, L. R. Hicks. Public Relations Section (H. L. Harris, Boston): Cooperation with educational institutions, E. L. Olds; industrial relations, R. H. Wheelock; public speaking, S. T. MacQuarrie; relations with financial institutions, C. H. Hodskinson; women, Miss A. M. Baker. Standing committees: Accident prevention, A. A. Packard; educational, E. S. Mansfield; rural electric service, H. M. Parsons; insurance, H. P. Hood; relations of electrical industry with agriculture, F. A. Belden; taxation, Bowen Tufts.

Men of the Industry

Samuel Insull, president of the Commonwealth Edison Company of Chicago, sailed for Europe August 18 on the Cunard liner *Aquitania* for a short stay abroad.

B. R. Amsden has affiliated himself with the Malden (Mass.) Electric Company, which is one of the properties of Charles H. Tenney & Company of Boston.

C. E. Nethken of Keyser, West Va., has been appointed a member of the Public Service Commission of that state by Governor Gore to succeed Ernest D. Lewis, whose term expired May 31.

James R. Stevenson, who retired last January as manager of the Monmouth (Ill.) Public Service Company and has since been doing special engineering work for the Kewanee (Ill.) Public Service Company, has been appointed manager of that utility to succeed John A. Todd.

Benjamin E. Ling has resigned as director of the Ohio Committee on Public Utility Information, Cleveland, to become identified with the office of the president of the Cleveland Electric Illuminating Company in charge of public relations and suburban development. As a newspaper man Mr. Ling had devoted himself to public utility affairs in Cleveland and northern Ohio, and when the Ohio committee was formed in 1920 he was selected to direct it.

C. Harold Berry has joined the editorial staff of *Power,* a McGraw-Hill publication, in the capacity of associate editor. Mr. Berry was formerly connected with the research and production departments of the Detroit Edison Company, later becoming assistant to J. W. Parker, chief engineer of the company. More recently he was made technical engineer of power plants, responsible for testing and operating economy in the four steam generating stations.

G. H. Bucher, assistant general manager of the Westinghouse Electric International Company, left New York, August 14, for Japan, via Seattle, where he will assist in the organization of the newly formed Westinghouse Electric Company of Japan. Mr. Bucher sailed from Seattle on August 19 on the Dollar Line steamer *President Grant* for the Orient. He will also visit China, the Philippine Islands and other parts of the Far East to investigate the electrical business outlook.

Ralph B. Lillie, who has been manager of the Wisconsin Valley Electric Company's electric properties at Tomahawk for a number of years, has been named general manager of the Antigo Electric Company, recently taken over by the First Wisconsin Trust Company of Milwaukee. John Manser has been president and manager of the Antigo Company. New officers of the company are: R. P. Baird, Milwaukee, president; C. F. Geilfuss, Milwaukee, vice-president, and P. H. Edwards, Milwaukee, treasurer.

J. Anderson and G. W. Van Derzee Vice-Presidents in Milwaukee

John Anderson, who has been connected with the Milwaukee Electric Railway & Light Company since 1912 as chief engineer of power plants, has been promoted to the post of vice-president in charge of power. Mr. Anderson

JOHN ANDERSON

was largely responsible for the erection and successful operation of the Lakeside powdered-fuel plant, which was a pioneer in reducing operating expenses by the use of pulverized coal. The preparatory education of Mr. Anderson was received in Scotland and England, following which he began his engineering career in the engine rooms of the North Atlantic's liners plying between America and Europe. Later he entered the public utility field and was appointed assistant chief engineer of power plants by the Union Electric

G. W. VAN DERZEE

Light & Power Company at St. Louis. He continued with that company until 1912, when he left to become chief engineer of power plants with the Milwaukee company.

G. W. Van Derzee, who has been handling the work of assistant vice-president of the Milwaukee Electric Railway & Light Company since 1913, has also been rewarded with a vice-presidency in recognition of his meritorious work in the company's electric service department. Since 1918 Mr. Van Derzee has been in charge of the development of the company's electric properties.

After being graduated from the public schools of Milwaukee he entered the electrical engineering department of the University of Wisconsin and subsequently taught for two years at the Michigan School of Mines. He then entered the Schenectady works of the General Electric Company and later became identified with its sales department.

To fill the vacancies left open in the company's power-plant department because of the above promotions, **Fred Dornbrook** has been elevated from superintendent of construction and operation to be chief engineer of power plants, **George J. Lawrenz** and **M. K. Drewry** have been named assistant chief engineers of power plants and **Lyness Evans** first assistant engineer of the power-plant department.

E. P. Coleman of Hamilton Resigns

E. P. Coleman has resigned as general manager of the Dominion Power & Transmission Company, Hamilton, Ontario, a position he had occupied since 1912. Mr. Coleman has been identified during his career with several light and power companies, among them being the Attleboro (Mass.) Steam & Electric Company, the Plymouth (Mass.) Electric Light Company and the Consolidated Lighting Company, Montpelier, Vt. From June 1, 1905, to March 1, 1907, he practiced as a consulting engineer in electric light, power and railway work. He was a member of the Canadian Electric Railway Association's executive committee for several years, was vice-president in 1915-1916, president in 1916-1917 and treasurer from 1923 to 1925.

H. M. Lytle has been elected vice-president of the Chicago Rapid Transit Company and also of the Chicago North Shore & Milwaukee Railroad in charge of their public relations departments. In order to perform the duties of these offices Mr. Lytle will resign as associate director of the Illinois Committee on Public Utility Information. He will, however, remain in close contact with the work of the committee.

William A. Knost, for the past four years secretary of the Los Angeles Electric Club, has resigned that position in order to devote his entire time to his new work on the sales staff of the Illinois Electric Company. Mr. Knost will handle appliance sales and general merchandise, exclusive of radio equipment, with headquarters in Los Angeles.

Harold Bates has joined the sales department of the Bridgeport Brass Company to engage in sales organization and research work. Before entering the industrial field Mr. Bates was affiliated with the public utility business, mainly in the electric railway branch. He aided in the development of the sales program of the Winchester Repeating Arms Company, New Haven,

Conn., serving successively as sales engineer in charge of the development of new products, superintendent of the sales engineering department, supervisor of sales planning and, later, in charge of special and jobbing sales of all new products.

F. W. Coleman of Windsor, Ontario, has been appointed manager of the Fredericton (N. B.) plant of the Maritime Electric Company, Ltd.

J. T. Nolen, district engineer of the Alabama Power Company at Albany, has been transferred to the Sheffield office, and **R. C. Kirby,** formerly at Birmingham, has been transferred to Albany to succeed Mr. Nolen.

H. V. Putman, formerly assistant chief engineer of the Ideal Electric & Manufacturing Company, Mansfield, Ohio, is now connected with the Westinghouse Electric & Manufacturing Company at East Pittsburgh (Pa.) in the power engineering department.

S. N. Jordan, formerly electrical engineer of the People's Gas & Electric Company, Burlington, Iowa, is now chief electrical engineer in that city for the Iowa Southern Utilities Company, which recently took over the Burlington properties.

Obituary

Robert B. Butler, assistant secretary of the United Illuminating Company, New Haven, Conn., died August 6 as the result of an automobile accident near Concord, N. H. Mr. Butler had been connected for more than twenty years with the United organization.

Alfred M. Poindexter, president of of the Poindexter Electrical Supply Company of Denver, died August 12 after a short illness. Mr. Poindexter, who was also treasurer of the Park Hill Improvement Association, was fifty-one years of age.

George Duncan Milne, for many years connected with the American Telephone & Telegraph Company, died August 11, at his home in Lexington, Mass. Mr. Milne, who was in his seventy-third year, was born in Scotland in 1852. He became connected with the Bell Telephone Company in Boston in 1879 and several years later was transferred to the American Telephone & Telegraph Company, where he was made assistant treasurer. In 1911 he became treasurer of the company, with headquarters in New York. Mr. Milne retired from active business in 1922.

O. J. Gude, prominent American advertising man and pioneer in electric advertising signs, died August 15 in Bad Nauheim, Germany, in his sixty-third year. Mr. Gude had been in ill health for several years and was in Bad Nauheim at the time of his death for treatment. About twenty-five years ago he erected at Twenty-third Street and Broadway, New York, what is believed to have been the first electric advertising sign, and he is responsible also for what is said to be the largest electric sign in the world—the Wrigley sign on top of the Putnam Building at Seventh Avenue and Forty-third Street, New York.

Commission Rulings

Commission and Municipal Plant Clash Over Earnings.—Finding that the earnings shown by the municipal electric plant of Manitowoc were too high, the Wisconsin Railroad Commission recently ordered a reduction totaling $35,000 in residence and commercial rates. The city has responded by also reducing the rates for municipal departments and street lighting on the ground that it should have the benefit of reductions if revenues exceed the amount fixed by law. The commission now charges that the rate fixed for city service is too low and discriminatory, out of proportion to the cost of service and put into effect without first obtaining the consent of the state, and the regulatory body announces that it will investigate this branch of the city's business with a view to bringing the two schedules back to the old level—2½ cents per kilowatt-hour for the municipal departments and $10 per 60-cp. lamp for street lighting, as compared with 1 cent and $8.

Utility Companies Forbidden to Destroy Shade Trees Without Permission of Highway Commission.—In accordance with a decision of the Attorney-General, the Wisconsin Highway Commission has forbidden utility companies to destroy shade trees in the construction of transmission lines, even though they have the consent of the owner of the adjoining land, without permission from the commission.

Proper Appropriation for Retirement Expense.—The Rockford Electric Company asked the Illinois Commerce Commission for permission to charge 7.5 per cent of the value of its property to its retirement reserve, claiming that annual retirement allowance should be based upon reproduction cost. Disagreeing, the commission said that the classification of accounts prescribed for electric utilities contemplates that retirements of property shall be made at their original cost and that replacements, if costing more than the property retired, shall be added to the capital account as the difference between replacement and original cost. "An allowance for annual retirement expense must, therefore," the commission said, "be based upon the original cost of the property and not upon the reproduction cost. The allowance of 7½ per cent contended for by the witness for the utility would, if retirement reserve were credited with interest at a reasonable rate, return to the utility the whole reproduction cost new of this property in a little more than ten years or would return the original cost of the property in slightly less than six years. Such an assumption of average life of this property is unreasonable, even considering the fact that the property in Rockford has undergone frequent rebuildings and extensions to enable it to keep pace with the demand for service in Rockford and the progress of the art. The commission believes that the allowance recommended by its own engineer [4.393 per cent on original cost] is an adequate and fair allowance for annual retirement expense on this property."

Rendition of Service Ordered Despite Its Unprofitable Nature in Past and Alleged Unpaid Bill Due by Applicant.—The Wisconsin Railroad Commission ordered the Southern Counties Power Company to extend service to the Pet Milk Company of Belleville despite the power company's contention that a bill for power due from the predecessor of the milk company should first be paid. The power company asserted that the Pet Milk Company had refused to pay the bill incurred by its predecessor and had told the power company to remove equipment it owned from the milk company's plant; that this had been done and the apparatus sold at a sacrifice; that the power company subsequently increased its substation capacity at the request of the milk company, which failed to make use of the enlarged capacity and thus brought about its abandonment, and that the present requirements of the milk company were irregular and its load factor poor. The commission found these reasons insufficient for denying service, which the milk company required only during the non-operating hours of its own plant, and doubted its right to deal with the unpaid bill. However, it drew up a special demand and energy schedule designed to bring a fair return to the power company.

Recent Court Decisions

Iowa Courts Will Review Judgment of Industrial Commissioner if Facts Are Undisputed.—The Supreme Court of Iowa has held repeatedly that in a case heard before the Industrial Commissioner and involving compensation where the evidence is conflicting the finding of the commissioner is binding upon the court, but where the facts are not in dispute it is within the province of the court to review the conclusion of the commissioner, based upon such undisputed facts, and to determine whether or not there is "sufficient competent evidence in the record to warrant the making of the order or decision." In Guthrie vs. Iowa Gas & Electric Company there was no dispute that a man employed as a bricklayer on a company building was struck on the knee by a hod, that two years later tuberculosis developed in this knee with a resulting amputation, and that some time later he died of tuberculosis of the lungs. The Industrial Commission awarded compensation for the loss of the man's leg and disability to the time of his death, but on appeal the court held that there was not sufficient evidence to show that the injury caused tuberculosis in the knee or that the tuberculosis which was present in his lungs did not develop in the knee from some cause entirely different from the old injury. (204 N.W. 225.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

The Near-by Latin Markets—Part II

Electrical Conditions in Guatemala and Mexico and Some Observations on the Present and Prospective Market

By R. A. LUNDQUIST
Chief Electrical Equipment Division, U. S. Department of Commerce

THE average American manufacturer of electrical equipment has it very much in mind that the near-by Latin markets of Venezuela, Colombia, Central America and Mexico are backward in the use of electricity and that their purchasing power does not average as high as ours, but is apt to overlook the fact that the conditions in these countries are very steadily improving. Standards of living are rising, and with this comes constantly expanding opportunity for the sale of electrical products. Electrical development has been backward, especially in the countries to the south, but progress in Guatemala and Mexico has been more active than is generally appreciated. This fact impressed itself upon me particularly during my recent trip and is a challenge to the American producer.

Guatemala was the last of the Central American republics visited and there I found the principal central stations in the hands of an American holding company, and business being developed along lines similar to those employed here. The use of appliances was being promoted by a regular commercial department, with a downtown display room, and very good results were being obtained. While the bulk of the business of the past had been done with foreigners settled in Guatemala, the Guatemalan people themselves are more and more taking to modern electrical devices. While there is still a great deal of flat-rate business which tends to limit the adoption of household devices, more and more metering is being done, and the handicap will undoubtedly be removed to some extent in the course of time.

Through the influence of the power company, new wiring regulations are coming into force and electrical contractors in Guatemala City are being licensed, which will naturally result in a higher standard of work.

A local power company at Guatemala City has been feeling out the market for high-grade lighting fixtures and was surprised at the rapidity with which they were taken. It was said that the brushed-nickel finish has proved very popular. With the possible exception of San José, Costa Rica, Guatemala City has the best store lighting of any of the towns I have hitherto visited. A great deal of effort has been made to promote better illumination in business establishments, and the results were apparent.

While there was some display of electric signs in San Salvador, the proportion in Guatemala City far exceeded that of any other city in Central America, and the installations were of a good type. This is also the result of the promotional efforts of the central station and is an indication of what can be done in Latin American countries.

Exports of electrical equipment from the United States to Guatemala were $169,195 in 1920 and $459,490 in 1924.

MEXICO A LOGICAL FIELD FOR US

Mexico is, of course, the largest and the most important of all near-by Latin markets for electrical goods. Its population of somewhere in the neighborhood of 13,000,000 is about as great as that of all the other markets I covered on this trip. It is furthermore a market in which there is a heavy investment of American capital. Again, it touches upon our territory and is worked to some extent by jobbers in our border states. The central-station practice is much the same as ours, except that 50 cycles are used in the two most important cities, Mexico and Guadalajara. Generally speaking, the electrical business in Mexico is fair at the present time, but purchasers are buying in limited quantities, according to local dealers.

German manufacturers are very active in Mexico, the Siemens-Schuckert Company having a very large central establishment in Mexico City, with branches in the more prominent distribution centers. The Asea Company, of Sweden, is also active in the apparatus field and I saw the Heemaf motor of Holland in this market for the first time. While American manufacturers appear to be holding their own in the apparatus field, Germany has taken business on the basis of extraordinary terms in a few instances, and Sweden has secured orders for transformers on the basis of price, though where that was true, it was generally found that they were low in weight as well as in price. In the motor field, German competition has been felt only in motors up to 25 hp., in which range German manufacturers have a considerable price margin. On the other hand it is apparent that the quality of these German motors is not equal to that of the American products.

In the wiring device field, German manufacturers are offering fair quality goods at extremely low prices and are taking a good deal of the business. A number of standard American lines are being copied very closely and this has resulted in the loss of some little business to this country.

Electrical appliances also have a fair sale in Mexico, but the bulk of the purchases are apparently made by foreigners, except in the case of electric irons. It is said that the use of irons in many of the cities has been stimulated by the lack of charcoal during revolutionary times.

Exports of electrical equipment from the United States to Mexico were $4,298,223 in 1920 and $6,173,755 in 1924.

FAVORABLE CONDITIONS

Reviewing the general situation in the countries I visited, I feel that we are hardly taking full advantage of the possibilities of these near-by markets. That remark need not be confined to the electrical field, because we are possibly covering it as well in electrical lines as in any other. There are a number of factors that favor us in these countries. They are near us and we should be able to give them service more efficiently and more promptly than any other country in the world. Then there is the money factor. In practically every country I visited, excepting Mexico, I found American money taken practically as freely as the local currency, and in several cases American money is almost legal tender in that certain official payments may be made in American currency.

Another favorable situation is the amount of capital either invested by Americans in those countries or controlled through American management. As a result of this situation, there are a great many Americans living in these republics, which naturally reacts to spread American standards in addition to creating a direct demand for home products. Again, there is the matter of education. It is a custom of most wealthy families in the countries I have visited to send their sons and daughters to the United States for higher education, and the contact with American standards is bound to carry with it a

MR. LUNDQUIST, in last week's issue, discussed the electrical market situation in Venezuela, Colombia and the Central American republics south of Guatemala, giving his opinion as to the possibilities for the development of export business for American manufacturers. In this paper he describes these two larger countries that are so much more advanced electrically and concludes with some general observations.

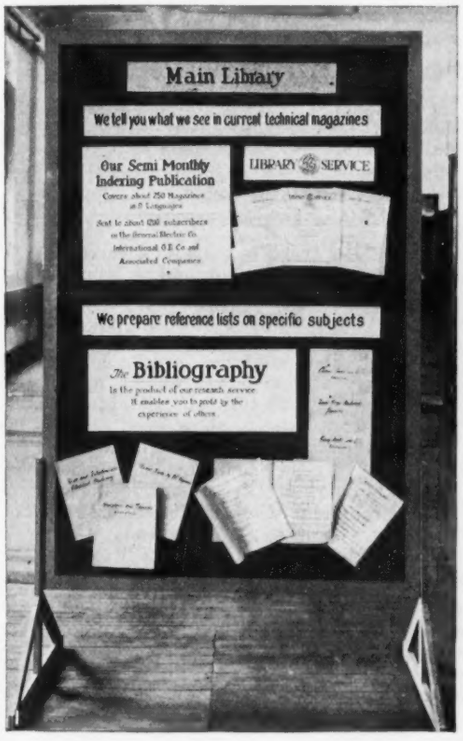
liking for American goods upon the return of these young people to their home countries. Taking these neighboring countries as a whole, they are natural business friends of ours. We buy a lot of their products and they will buy ours, and the easier we make it for them to get our goods, the more they will buy.

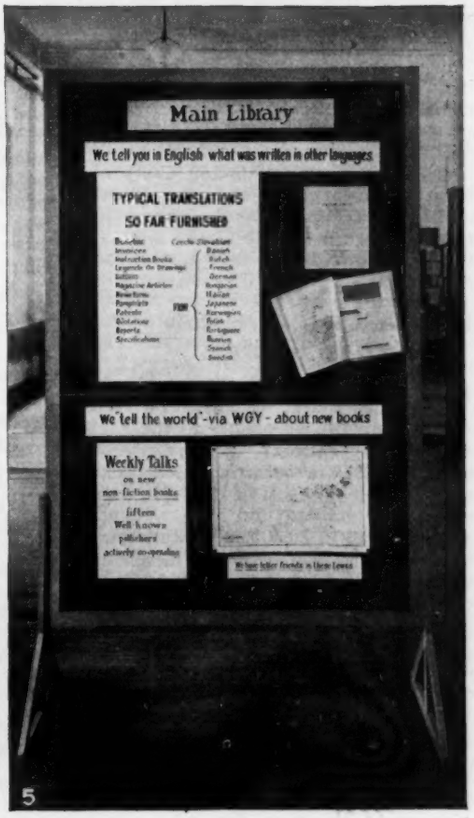
While in Mexico I heard of a number of instances where German manufacturers had given buyers of power plant equipment long terms; in one case giving the purchaser two years in which to pay for his equipment. The American firms were naturally somewhat downhearted over competition of that sort, and while we were talking it occurred to me that we in the United States, who pride ourselves on our efficiency in business, are able to sell on the installment plan, which usually implies at least a year's terms, such necessities as motor cars, vacuum cleaners, phonographs and radio sets, but are unable as yet to help a man when he wants to indulge in the luxury of a power plant or some new factory equipment or the like. In the motor car field we have worked out acceptance corporations which have appeared to function well, both for the corporation and for the man who is buying the car. It has always struck me that we should be able to develop something along the same lines to enable our manufacturers to compete for this long-term business that is going to foreign manufacturers.

I appreciate that laws and customs in foreign countries differ from ours, but if our competitors can do it under those conditions, we, with our resources, should be able to go as far as they can. It must be realized, of course, that not all of this long-term business is sound, but there must be a worth-while proportion that is safe.

Selling an Industrial Library to Employees

AN INDUSTRIAL library is an asset to a manufacturer only so far as it is used, regardless of the wealth of valuable information it may contain. A unique method of selling the company


Main Library
We tell you what we see in current technical magazines
Our Semi Monthly Indexing Publication
LIBRARY SERVICE
We prepare reference lists on specific subjects
The Bibliography



AN EXHIBIT ESTABLISHED TO SHOW EMPLOYEES WHAT THE COMPANY'S INDUSTRIAL LIBRARY OFFERS THEM

1. Panel illustrating the current news service and the technical research service.
2. A general view of the booth containing the library.
3. General view of the reading room, conveniently located in the main library of the company.
4. Exhibits showing how the library information is organized and how other G.E. libraries co-operate.
5. Panel depicting the translation service and the radio talks from WGY.

library to its employees resulted from a recent sales conference at the General Electric Company, Schenectady. The main library of the company is under the direction of the publicity department, which furnished a booth as shown. This internal exhibit portrayed by charts, diagrams, publications and advertisements the various services that are rendered by the library service to the organization as a whole.

The publicity exhibit, although fundamentally intended for the department heads and officials, was found to be of such interest that employees were invited to inspect it. The library management soon noticed an increase in its activity as a direct result of the discovery by employees that the services were available.

Business Conditions

THE electrical market is stronger this week. A larger number of good-sized orders are reported from virtually all sections, and business seems to be quickening to the approach of fall. The enormous volume of building and construction continues; production is greater than last year in most basic industries; the crop situation is encouraging; car loadings, already very large, have further increased; exports are at high levels; the leading wholesale prices indices continue to advance, and the outlook is therefore good for the electrical business. Central-station buying is still the most active factor in the market. Wholesalers' and retailers' stocks are low, and current buying is in fair volume.

New England reports activity in the industrial heating and all lighting fields, with good sales of motors and recording instruments. There is active buying of line equipment in the New York district, with many small orders for motors and wiring materials. Power companies in the Southeast have begun to curtail service to meet the continuing drought, but the market in general continues strong. In the Middle West jobbers report a steadier market, and central-station companies have placed large orders there for cable and busbar copper. Active range sales continue on the Pacific Coast, and sales to power companies and to railroads are extensive.

Building Contracts in July Highest on Record

CONSTRUCTION contracts in July reached the highest total on record for that month, according to the F. W. Dodge Corporation. Contracts in the thirty-six Eastern states, which include about seven-eighths of the total construction volume of the country, amounted to $529,000,100. July building contracts in Texas, not included in the above, amounted to $18,106,300. In only two previous months has the total first given been exceeded, April and June of this year. The decrease from June was only 2 per cent, while the increase over July last year was over 53 per cent. There is usually a considerable seasonal decline in July.

Last month's record included $224,712,500, or 42 per cent of all construction, for residental buildings; $72,743,400, or 14 per cent, for public works and utilities; $67,165,900, or 13 per cent, for commercial buildings; $58,148,000, or 11 per cent. for industrial plants (including a thirty-million-dollar power development in Ohio), and $57,572,000, or 11 per cent, for educational buildings (including large building projects for Harvard, Yale and Pittsburgh universities).

Prices Still Rise in Non-Ferrous Metal Market

THERE has been a fair volume of business in the non-ferrous metal market this week, with gradually improving prices for copper, lead and zinc. Sales of copper were less than half the total of last week. Lead continues scarce with a wide range of prices.

On Friday, Saturday and Monday producers were holding copper at 14¾ cents, but a good tonnage of cheaper metal was offered so little business was done. London offerings had disappeared by Tuesday and the price seems well established at 14¾ cents. The contract price for lead set by the American Smelting & Refining Company was increased three times during the week—on Thursday, August 13, to 9.15 cents, on Friday to 9.25 cents and on Wednesday, August 19, to 9.40 cents. Inquiries continue in large volume.

NEW YORK METAL MARKET PRICES

	Aug. 12, 1925 Cents per Pound	Aug. 19, 1925 Cents per Pound
Copper, electrolytic	14.70	14¾
Lead, Am. S. & R. price	9	9.40
Antimony	18¼	18¼
Nickel, ingot	33–34	33–34
Zinc, spot	7.90	7¼
Tin, Straits	58	57.50
Aluminum, 99 per cent	27	28

Base copper price Aug. 19, 1925, 16½ cents.

Growth of the Electric Clothes Washer Industry

A SPECIAL bulletin has just been published by the banking house of Hornblower & Weeks discussing the status of the electric clothes-washer industry.

In 1914, they say, it is estimated that there were 50,000 electric washing machines in use in the United States, valued at $5,000,000, while ten years later, in 1924 there were more than 4,000,000 such machines, valued at over $600,000,000. The average value of each machine is estimated at $150. At the current rate of consumption and allowing for wear and tear, they estimate that in 1929 there will be over 7,600,000 washing machines in use in 22,850,000 wired homes, valued at over $1,100,000,000, or thirty-three for every hundred wired homes. If this rate is increased to even forty in every hundred, as it well might be, the total electric washing machines will exceed 9,000,000, or over twice the number now in every-day use.

The estimates for the years 1925 to 1929 are as follows:

Year	Total Machines in Use	Increase	Total Wired Homes	Increase
1925	4,725,000	600,000	14,850,000	1,600,000
1926	5,375,000	650,000	16,600,000	1,750,000
1927	6,075,000	700,000	18,500,000	1,900,000
1928	6,825,000	750,000	20,600,000	2,100,000
1929	7,625,000	800,000	22,850,000	2,250,000

Figuring the life of an electric washing machine at ten years, it is obvious that the replacement requirements alone four years from now will reach over 700,000 units, or more than has been produced in any year to date in the industry.

Out of about a hundred companies manufacturing electric washing machines, there are today three which are furnishing 46 per cent of all the machines now on the market.

New England Sales Show Improvement

THE trend in sales of electrical supplies and equipment throughout New England during the past week shows a marked improvement. Electrical recording instruments are selling well, and numerous orders have been received from power plants, pump stations and substations. Industrial heating continues to show good activity in Connecticut, and industrial lighting is receiving increasing attention under the stimulus of a promotion campaign throughout this district. Lighting fixtures are in good demand. Commercial units are attracting a little interest and illuminated electric signs are gaining in popularity.

Small motors are steady with production at a fair level. One manufacturer reports an output of about 75 per cent of normal and another a trifle less. Orders are scattered and in small lots, though one hundred motors of small horsepower were sold by one manufacturer during the week for use in manual-training departments of schools. Transmission-lines supply sales are spotty. Poles, cross-arms, wire and line hardware show less activity.

Domestic appliances, except flatirons and refrigerating units, lag somewhat, though total sales to date of the common appliances show a marked increase over 1924. Refrigerators, on the other hand, are gaining steadily. Oil-burning equipment with electrical operating units is also strong and many inquiries are being received.

Building construction is progressing rapidly. The tendency for larger socket, switch and fixture installations is marked.

Active Week on Pacific Coast—Industrial Sales Strong

THE past week has been marked on the Pacific Coast by many large orders, which include one carload of 3½-in. fiber conduit and 10,000 cross-arm braces from power companies; 200,000 ft. No. 14 heater cord for an electric heater manufacturer and a six-

thousand-dollar fixture order for the Stockton City Hall. Railroad purchasing includes a great variety of wires for shop uses, steel pins, guy clamps, telephone dispatching material, ¾-in. and 1-in. galvanized conduit and condulets. All wires are moving well, the week's business including a thirty-five-hundred-dollar order from Sacramento for sizes No. 4/0 to 500,000-circ.mil rubber-covered wire, a two-thousand-dollar order for 750,000-circ.mil varnished-cambric cable for the Merced Irrigation District and 6,000 lb. of weatherproof wire for the United States Coast Guard Service. Bare copper wire and galvanized wire also show good movement, especially bare copper.

It is estimated that five hundred ranges will be sold during August. The older floor stocks and miscellaneous types have nearly all been disposed of, which will mean a larger proportion of reorders from now on. Appliance sales have improved markedly. Percolator sets are selling well throughout the territory, but as dealers' stocks were heavy, the jobbers are just beginning to participate in the demand. Motor business continues good and irrigation sizes are selling surprisingly well for this time of the year.

Seattle jobbers report many inquiries. There has been a slight slackening in home building in the northwest since the first of the month and fewer larger structures are announced, but sales of domestic appliance lines have increased and ranges are moving particularly well.

Central-Station Buying Active in Southeast Despite Drought

CENTRAL-STATION activities continue to occupy the market in the Southeastern States, and splendid orders for poles, pole-line hardware and other lines of construction materials are reported, particularly from Florida, Alabama and south Georgia. Distribution transformers and meters are in good demand as a result of this construction. "White-way" installations are also continuing to come in satisfactorily, one Atlanta jobber reporting an order from a south Georgia town for $15,000 worth of this equipment, with two jobs of similar size expected this week.

Extremely hot weather has caused a revival of the movement of fans, and all dealers report excellent business in buzz, ceiling and exhaust types. Wiring materials continue spotty and somewhat slow. The larger contractors are buying in satisfactory volume, and several good orders for industrial-plant equipment have been received in the past ten days.

Commercial lighting fixtures are fairly active and residential types in good demand, but industrial fixtures are slow for this period of the year. Steam railroads are ordering a fair volume and prospects are for a sharp pick-up in the fall. Radio equipment is beginning to respond to the approaching fall, with noticeable increase in demand for higher-priced sets. Dealers are loath to stock heavily, however.

The long drought in this section continues and crops are suffering badly. Owing to the extremely low stages of the rivers, the Georgia Railway & Power Company has been forced to notify large industrial customers to curtail their demand during the day. Other companies will have to follow suit unless rain comes soon.

Middle West Holds Steady—Good Central-Station Purchases

THE quickening of business which became apparent in the Middle West at the beginning of the month continues, and reports from various districts further confirm this tendency.

Central-station purchases are still an important factor in general business, with a single purchase of lead-and-paper cable by one of the utility companies in excess of $2,000,000 one of the outstanding features. Other interesting orders were one for approximately 125,000 lb. of busbar copper, a quantity of current transformers and several carloads of fir transformer arms. There has been a steady demand for pole-line hardware and line insulators.

Jobbers' sales have been steady, with a general betterment in view. Flat-iron sales continue to lead the appliance sales, but large quantities of portable lamps have sold readily.

Prices remain firm, with an upward tendency. One manufacturer of wiring devices revised prices, announcing slight changes. Certain types of heavy-duty, portable cord prices were advanced.

Business Up in New York District —Power Companies Active

THE electrical market has shown a better tone in the New York district this week. The jobbing houses are still floating through the summer doldrums, but business has picked up noticeably. Contractors continue to buy in small lots, but their stocks are low and the resultant volume is considerable. Jobbers' stocks are also low in about the same degree, and a fair volume of general buying is flowing to the manufacturers. Competition for this business has become very keen, and intensive sales efforts are being planned for the opening of the fall season to begin soon after September 1.

Central stations are placing many small orders for distribution equipment, pole-line hardware, small transformers and other materials used in ordinary extension and maintenance. Pole-line hardware manufacturers look for a steady increase in demand in this section. This week's sales were better than for the two weeks previous. Motors are moving faster in all classes.

Marine equipment has been in strong demand. Two important orders for heavy power equipment are reported in this market, one totaling $500,000 for motors, switchboards and auxiliary station equipment for a New York central station, and a 45,000-hp. steam turbine unit, a 30,000-kw. generator and a 35,700-sq.ft. condenser for a Texas power company.

Activities of the Trade

Habirshaw Cable Company Reorganization Plans Completed

More than 90 per cent of the creditors and stockholders of the Habirshaw Electric Cable Company have deposited their claims and stock for exchange under the reorganization plan which has been approved by Judge Augustus N. Hand of the United States District Court. The reorganization plan provides for the pro rata distribution of 150,000 shares of the new corporation, the Habirshaw Cable & Wire Corporation, the remaining 20,000 shares of which are to be turned over to W. A. Harriman & Company to cover $300,000 required for new working capital.

Included in the plan is a provision for making cash payments to non-assenting creditors on the following basis: Habirshaw Electric Cable Company, 42.81 per cent; Electric Cable Company, 49.97 per cent; Bare Wire Company, 54.25 per cent. The properties in the receiver's hands will shortly be turned over to the new company, when it will begin functioning.

International Telephone Buys International Western Electric

The Western Electric Company, Inc., announces that arrangements have been made for the sale of the International Western Electric Company to the International Telephone & Telegraph Corporation. The company announces that it has decided to withdraw from the foreign field and devote its resources to business within the United States.

The International Western Electric Company, under its new ownership, will continue to have exclusive licenses under the foreign patents of the Western Electric Company in the telephone and telegraph field and will also continue to act as the exclusive distributor outside of the United States, Canada and New Foundland for Western Electric manufactures. George E. Pingree, vice-president and general manager of the International Western Electric Company, will become its president, and Philip K. Condict, vice-president of the International Western Electric Company, will become its executive vice-president.

Straight-Line Production for New Westinghouse Plant

A fully equipped plant of large capacity for the production of transformers has been erected at Sharon, Pa., by the Westinghouse Electric & Manufacturing Company. This plant covers 42 acres of land and has a floor space of 700,000 sq.ft. The plant is at present employing 2,500 men, with possibilities of taking care of 3,500 men when the complete power transformer section is moved, and will manufacture distribution, instrument and power transformers, reactors, street-lighting reactors and rotary transformers. The materials used in production are taken in at one end of the plant and gradually go through

long buildings, coming out at the other end as a complete transformer ready for shipment.

For testing purposes this new Sharon plant will be equipped with the most modern of apparatus, including an 800,000-volt unit and a 500,000-volt unit, which will permit the obtaining of any voltage from 1,300,000 volts down. The 800,000-volt transformer tester just mentioned is probably the largest commercial tester in existence.

This building, one of the largest in the world, is 1,200 ft. long, 150 ft. wide and 86 ft. in height, and in addition there are three other buildings, each about a fifth of a mile in length and averaging in width from 100 ft. to 200 ft.

Cutler-Hammer Company Acquires Payne Dean, Ltd.

The Cutler-Hammer Manufacturing Company has recently purchased the business and patents of Payne Dean, Limited. The Dean Valve control apparatus has always been manufactured by the Cutler-Hammer Manufacturing Company, and this company has recently manufactured also much of the other equipment sold by Payne Dean, Limited, such as the auxiliary power-plant apparatus, including Dean signal systems, switchboards, load indicators, etc. The Cutler-Hammer Manufacturing Company will continue the development and manufacture of these devices and will also market them.

Mr. Dean and many of his associates are now connected with the Cutler-Hammer Manufacturing Company and will actively assist in the promotion of this work. Future communications should be addressed to the Cutler-Hammer Manufacturing Company, Boston, New York, Philadelphia, Buffalo, Pittsburgh, Cincinnati, Detroit, St. Louis, Chicago, Cleveland or Milwaukee, as may be most convenient. Inquiries from the Pacific Coast may be directed to the H. B. Squires Company, Los Angeles, San Francisco, Seattle or Portland.

J. R. McCardell & Company, Warren and Mill Streets, Trenton, N. J., announces the receipt of an order from the Merchants Heat & Light Company, Indianapolis, for one lamp trimming tower having a crows-nest type platform with collapsible guard rails. This unit is 22 ft. high when elevated and measures 11 ft. 3 in. when folded up.

The Fuller-Lehigh Company, Fullerton, Pa., has closed with the Acers-Poppenhusen Company, Chicago, as special sales representative in the Middle Western territory. The principal officers of the Acers-Poppenhusen Company are Ralph Acers and P. Albert Poppenhusen, both of whom have been identified as specialists in power plant equipment for many years past. Sales activities for the present will be centered upon direct firing installations, including the introduction and application of the Fuller-Bonnot unit mill and the Fuller impact pulverizer in connection with the utilization of pulverized fuel for boilers and furnaces.

The Imperial Electric Company, Akron, Ohio, manufacturer of alternating-current and direct-current motors and generators, announces the opening of a branch office in St. Louis at 911 Locust Street, in charge of C. O. Leaver.

Electrical Products Corporation of Los Angeles, Cal., has been combined with Claude-Neon Light, a company controlling the sale of Neon-Claude products for all territory west of the Rocky Mountains including Colorado. The new company will bear the name of Electrical Products Company and specialize in standard types of electric signs as well as theater lighting, outdoor and indoor illumination. Paul D. House retains the presidency.

James H. Betts has organized a new electrical manufacturing company under the name James H. Betts, Inc., with factory and headquarters at 1391-1395 Sedgwick Avenue, New York City. Mr. Betts, who is president of the new firm, was formerly with Betts & Betts. The new company will manufacture traffic-control apparatus, thermostatic flashers and flashing plugs, heavy-duty flashers, motor flashers, color caps for sign lamps and bell-ringing transformers, small and compact. James H. Betts, Inc., occupies the former factory of the De Forest Radio Company, near the High Bridge station on the New York Central.

The Union Metal Manufacturing Company, Canton, Ohio, has recently opened a district office at 237 Central Arcade Building, Miami, Fla., for handling the sale of Union metal lighting standards in the state of Florida. This office is being operated under the name of the Florida White Way Illuminating Company, Inc., and is in charge of Frank E. Filer and C. A. Williams.

The Kuhlman Electric Company, Bay City, Mich., has appointed the Stevens Sales Company of 134 West Second South Street, Salt Lake City, as district representative for Utah and parts of Idaho and Nevada adjacent to Utah. The Stevens Sales Company will handle Kuhlman power, distribution and street-lighting transformers.

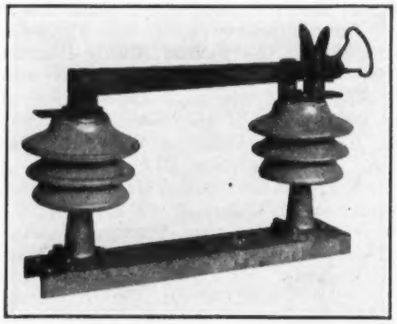
The Line Material Company of Milwaukee has acquired a two-acre tract at Clarks Summit, Pa. There are three buildings already on the site, and the company will erect two additional structures, to cost $250,000.

The Gibb Welding Machines Company (successor to Gibb Instrument Company) of Bay City, Mich., manufacturer of electric welding equipment, announces the appointment of Arthur Jackson, 32 Glenholme Avenue, Toronto, as sales representative for Ontario and eastern Canada. The Gibb Welding Machines Company's line comprises arc, spot and seam welders.

New Equipment Available

Disconnecting Switches and Outdoor Bus Supports

A line of disconnecting switches for voltages from 7,500 to 132,000, using a one-piece solid porcelain insulator on each post, has been placed on the market by the Champion Switch Company, Buffalo, N. Y. The insulators are manufactured without the use of cement, and the hardware is attached by means of cap screws engaging threaded brass sleeves set permanently into the porcelain by means of the Jeffery-Dewitt alloy metal process on a 2¾-in. diameter bolt circle top and bottom. All sizes have the same bolt circle so that the hardware is interchangeable.



DISCONNECTING SWITCH USING A ONE PIECE INSULATOR. NOTE BRONZE COMPRESSION SPRINGS ON SIDE OF BLADE

The hinge clip and contact clip on all of these switches are made of one-piece drop-forged copper on which a conductivity of 98½ per cent is guaranteed. Contact pressure between the blade and contact tongue is insured by means of bronze compression springs on either side of the blade, which throw the compression on the bars of the blade at the center point of the contact tongue. All iron parts of the switch are hot dipped galvanized after the machine work has been completed. The pins are of cast malleable iron. A line of outdoor bus supports using the one-piece porcelain insulators has also been placed on the market by the company.

Soldering Iron.—A soldering iron designed to meet extreme requirements where a soldering iron is necessary for heavy work has been placed on the market by Harold E. Trent, 259 North Lawrence Street, Philadelphia. It is made in two styles, a spear shape and hatchet type. Both of these have a copper tip in which the heating unit is clamped and which can be left on indefinitely at its rated voltage without overheating the tip or burning the unit out. The element consumes 500 watts at 110 volts.

Lightning Arrester.—A safety feature has been added to its type LV "Autovalve Glow Discharge" lightning arrester by the Westinghouse Electric & Manufacturing Company that will prevent the falling of heavy pieces of porcelain should the arrester be subject to the excessive voltage of a direct stroke. This safety feature consists of a very thin cross-section where the porcelain which supports the resistance disks joins the side wall of the porcelain casing. This thin wall, which fractures first, clears the line by allowing the disks to drop out.

New Trade Literature

AIR HEATER.—Catalog AH-2 issued by the Combustion Engineering Corporation, 25 Broad Street, New York City, describes and illustrates the "C-E" air heater, which is designed for pre-heating of air to be used in boiler furnaces, by means of returning to the furnace a large proportion of the heat ordinarily lost in the flue gases. It contains charts showing typical performances of the air heater and drawings showing various applications of the "C-E" heater.

CENTRIFUGAL PUMPS.—"The Automatic Operation of Centrifugal Pumps" is the title of a bulletin issued by Barrett, Haentjens & Company, Pine and Buttonwood Streets, Hazleton, Pa., in which they describe the methods used to operate centrifugal pumps without attention and also show how various automatic control devices can be used to insure protection against damage to the pump due to loss of water, suction air leaks and other operating difficulties.

FANS AND HEATERS.—Bulletin No. 3506 issued by the American Blower Company, Detroit, Mich., describes the "ABC" type "E" steel plate exhaust fans, which are especially adapted for removing shavings, sawdust, dust from grinding and buffing wheels, conveying material, and for removal of smoke, fumes, etc. It contains instructions for installing the fans and dimension tables showing the capacity of the various types of the type "E" fans. The company is also distributing a booklet entitled "The Venturafin Method of Heating," in which it describes the "Venturafin" method of heating. Illustrations and drawings showing typical installations of this heater are included.

AIR COMPRESSORS AND VACUUM PUMPS.—Bulletin No. 123 issued by the Pennsylvania Pump & Compressor Company, Easton, Pa., describes the Pennsylvania class "3A" and "4A" air compressors and "7A" and "8A" vacuum pumps. Illustrations are given showing various parts and applications of both the air compressors and vacuum pumps. The company is also distributing bulletin No. 124, covering the "Pensy-Portable" air compressor unit, which is designed for the use of construction engineers, contractors, public utilities and other large users for a combination unit.

OIL-FILLED CABLE BOX.—A leaflet distributed by Ferranti, Ltd., Hollinswood, Lancashire, England, calls attention to the Ferranti patent oil-filled cable box for transformers.

BOILER-ROOM OPERATION.—The Republic Flow Meters Company, 2240 Diversey Parkway, Chicago, has issued (Article VI) entitled "Results Achieved in Practice (Small Industrial Plant)," which is one of a series on boiler-room operation in which it gives results achieved in practice in small industrial plants.

ELECTRICAL TRADES DIRECTORY.—The thirty-eighth edition of the "*Electrician* Annual Tables of Electricity Undertakings" has been issued by Ben Brothers, Ltd., *Electrican* offices, 8 Bouverie Street, E. C. 4, London, England.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Chihuahua, Mexico (No. 16,251), of one 100-hp. generator, motors of 50, 20, 15 and 1 hp., transformer and wiring.

Purchase and agency is desired in Vienna, Austria (No. 16,253), for electric household labor-saving devices.

Purchase and agency is desired in Johannesburg, South Africa (No. 16,311), for electric miners' lamps.

An agency is desired in Bucharest, Rumania (No. 16,254), for light and power appliances, telephone apparatus and accessories.

Purchase and agency is desired in Athens, Greece (No. 16,326), for electric lighting apparatus for small centers and small ice plants.

An agency is desired in Beirut, Syria (No. 16,346), for farm-lighting plants and for motors.

Purchase is desired in Leicester, England (No. 16,252), for electric tire pumps, voltmeters and ammeters, motor-generators, rotary converters, switchboards, motors, generators and batteries.

Purchase is desired in Barcelona, Spain (No. 16,312), of fifty motors with centrifugal attachment for medical attachment.

Purchase and agency is desired in Mexico City, Mexico (No. 16,262), for radio sets and parts.

Purchase or agency is desired in Batavia, Java (No. 16,294), for radio sets and parts.

Purchase is desired in Melbourne, Australia (No. 16,233), for electric transporters and equipment.

Purchase or agency is desired in Marseilles, France (No. 16,200), for wiring supplies, sockets, switches, etc.

An agency is desired in Duesseldorf, Germany (No. 16,350), for transportation machinery, ventilators, compressors, pumps and boiler-room equipment.

New Incorporations

THE HEATH SPRINGS (S. C.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000 by F. Coke Bridges and S. E. Hanson.

THE SEQUATCHIE VALLEY LIGHT & POWER COMPANY, Pikeville, Tenn., has been incorporated with a capital stock of $60,000 by William G. Lusk and F. E. Tarvin.

THE SOUTHSIDE VIRGINIA POWER COMPANY, South Boston, Va., has been incorporated with a capital stock of $300,000 to build a hydro-electric plant on the Meherrin, Dan or Staunton River. The officers are: Ira Vaughn and James F. Penrose, secretary, both of 240 Susquehanna Street, Philadelphia.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

ORONO, ME.—Plans are being prepared by Strickland, Blodgett & Law, engineers and architects, 26 Pemberton Square, Boston, for a mechanical and engineering building for the University of Maine. The cost is estimated at $150,000.

BARRE, VT.—The City Council is considering extending the ornamental lighting system on Main Street from the fire station to the granite bridge, which will require forty-two lamps.

WORCESTER, MASS.—The New England Power Company has filed plans for the construction of an addition to its plant at 39 Harvard Street, to cost about $45,000.

NORTH PROVIDENCE, R. I.—A petition has been presented to the Town Council asking for the installation of street lamps on Josephine and Hurdis Streets in Marieville and Sheffield Avenue on Fruit Hill.

NEW BRITAIN, CONN.—The Fafnir Bearing Company, Booth Street, plans to install electric power equipment in its proposed plant addition, to cost about $175,000.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 25 for searchlight carbons, mica, fuses and fuse elements and electrical supplies, etc.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 1, for 900 sets storage battery testing outfits for the local navy yard, and for 100 sets for the Mare Island navy yard (Schedule 4214.)

BROOKLYN, N. Y.—The property and buildings located at 1116-1208 Manhattan Avenue, has been purchased by the Chelsea Fibre Mills, which plan to erect on this property a new mill and power plant. Peters & Peters, Inc., 25 Broadway, New York City, are engineers.

CEDARHURST, N. Y. — The Village Trustees have authorized Cyril Marshall, village engineer, to secure estimates of cost for the installation of a new street-lighting system on Central Avenue from Washington to Cedarhurst Avenue and on Spruce Street.

CLIFTON SPRINGS, N. Y.—Plans are under consideration by the Village Board and the managers of the Clifton Springs Sanatorium for the installation of fifty ornamental lamps on Main Street.

FORT ANN, N. Y.—Application has been made by the Kanes Falls Electric Company to construct an electric power plant at Truthville.

ELMIRA, N. Y.—The installation of special electric fire signal traffic controls throughout the business section of the city is under consideration by the City Council.

FALCONER, N. Y.—The Town Board of Ellicott is considering entering into a contract with the Niagara, Lockport & Ontario Power Company, Buffalo, for the lighting a number of highways, including Lakewood Road, Falconer-Frewsburg Road, North Main Street, Extension Road, and the Ellery Center Road.

LITTLE VALLEY, N. Y.—The Public Service Commission has authorized the village of Little Valley to extend the municipal electric light and power system into the town of Little Valley, which is now without electrical service.

NEW YORK, N. Y.—Bids will be received by the Board of Transportation, 49 Lafayette Avenue, until Aug. 28 for the construction and installation of two additional electric elevators at the 191st Street station of the Broadway-Seventh Avenue subway.

PULASKI, N. Y. — The Regal Paper Company plans to install electric power equipment in the proposed extensions to its mill, to cost about $100,000.

ROCHESTER, N. Y.—Plans are under way for the installation of a new lighting system on Bay Street, consisting of 130 lamps of 200 cp. mounted on concrete poles. The Rochester Gas & Electric Corporation furnishes the street-lighting service.

ST. GEORGE, N. Y.—Bids will be received by N. J. Hayes, Commissioner of Water Supply, Gas and Electricity, Municipal Building, New York City, until Aug. 28 for construction of a pumping and generating plant, and also a new building at the Clove pumping station, borough of Richmond.

SODUS, N. Y.—The Empire Mills have been acquired by the Preston Power Company, recently organized. The company, it is understood, plans to build a power plant at Sodus Center which will cost about $40,000.

ATLANTIC HIGHLANDS, N. J.—Extensions and improvements are contemplated by the Jersey Central Power & Light Company, Allenhurst, in its transmission and distributing lines in this district, to cost about $250,000. The constructon of a central repair shop at Long Branch, to cost about $30,000, is also under consideration.

ENGLEWOOD, N. J. — Arrangements have been made whereby ornamental lamps, maintained by underground wires, will be erected on streets surrounding the new depot park, including West Street, Tallman Place, Van Brunt Street, and Depot Park South. The work will be done by the Public Service Electric & Gas Company, Newark. The cost is estimated at about $46,000.

WESTVILLE, N. J.—The Borough Council is negotiating with the Public Service Electric & Gas Company, Newark, to place its wires underground on Silver Lake Avenue.

EPHRATA, PA.—Plans are under consideration by the City Council for extensions to the municipal electric plant, to double the present output.

KENNETT SQUARE, PA.—Bids will be received at the Council Chamber, Kennett Square, until Aug. 24 for furnishing and installing two centrifugal pumps and motors for constructing a cast-iron force main, and for furnishing electrical control equipment for waterworks pumping station.

MEADVILLE, PA.—The installation of a new power plant, to cost about $110,000, is under consideration by the Trustees of Allegheny College.

MIDDLETOWN, PA.—Work has started on the construction of an outdoor substation by the Metropolitan Edison Company, Reading. The station will be equipped for distributing both 66,000 volts and 110,000 volts. The substation of the York Haven Water & Power Company will ultimately be abandoned.

PHILADELPHIA, PA. — Plans for the proposed chocolate and confectionery factory to be erected by Blumenthal Brothers, Margaret and Bermuda Streets, at a cost of about $100,000, include a power plant. The Ballinger Company, 105 South Twelfth Street, is architect.

WILKES-BARRE, PA. — The Hazard Manufacturing Company plans to install electric power equipment in its proposed addition, to cost about $350,000. McCormick & French, Second National Bank Building, are architects.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company is considering the construction of a steam-operated electric power plant at the foot of McComas Street, to cost about $150,000.

PARKERSBURG, W. VA.—Negotiations are under way between the City Council and the officials of the Monongahela West Penn Public Service Company, Fairmont, for the installation of a new street-lighting system, to replace the arc lamps now in use.

HAMPTON ROADS, VA.—Bids will be received by the Bureau of Supplies and Accounts, Washington, D. C., until Sept. 8, for one switchboard and accessories for the local naval station (Schedule 4212.)

WASHINGTON, D. C.—Bids will be received by the Chief of Air Service, United States Army, until Sept. 1, for battery container assemblies (Circular 10.)

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until August 31, for electrical fixtures, fuses, switches, transformer, conduit, condulets, etc. (Circular 1689.)

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until August 25, for 50,000 ft. braided antenna wire No. 16, B. & S. gage (Circular C.P. 21807-1). Also, until August 31, for 700 ft. aerial cable, paper insulated (Circular C.P. 18957-182.)

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until August 25, for a quantity of globes and reflectors for various yards (Schedule 4167). Also, at the same time, for electrical supplies, testing generators, telephone supplies and insulating paper and tape, etc., for various yards (Schedule 4169.)

North Central States

DETROIT, MICH. — Plans have been filed by the Paige-Detroit Motor Car Company, Fort and McKinstry Streets, for an addition to its power plant.

ELK RAPIDS, MICH. — The Michigan Public Service Company, Cheboygan, which recently acquired the local electric plant, plans to erect a 33,000-volt transmission line to connect with the Cheboygan-Pellston line.

GROSSE POINT, MICH. — The City Council has plans under way for the installation of a fire-alarm and police-signal system. C. H. Marden, Old Whitney Building, Detroit, is engineer.

HAMILTON, MICH.—Plans are under consideration by the City Council for the installation of a municipal electric light and power plant.

HUDSON, MICH.—The Hudson Milling Company plans to install new equipment at its power plant, including an oil-burning engine.

MUSKEGON, MICH. — Arrangements have been made with the Consumers Power Company, Jackson, by the City Council whereby the former will extend its electric and street-lighting service across Pear Lake Channel to the city limits, including Shadyside.

YPSILANTI, MICH.—Condemnation proceedings against 100 acres of land needed for power development on the Huron River, near Ypsilanti, by the Fordson Power Company, Detroit, has been authorized by the Public Utilities Commission.

AKRON, OHIO.—Work has been started by the Northern Ohio Traction & Light Company on the extension of its light and power lines around the city of Akron in order to supply service to 2,000 additional residences and many industrial plants. The cost is estimated at $100,000.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Aug. 28 for steel smoke breechings and coal hoppers for the Division of Light and Power.

COLUMBUS, OHIO.—The installation of ornamental lamps in Hayden Park is under consideration.

COLUMBUS, OHIO.—The City Council is considering submitting to the voters at the election to be held in November the proposal to establish an ornamental lighting system the entire length of High and Broad Streets, and on Main Street, from Front Street to the east corporation line. It is estimated that about 18 miles of streets would be covered. The cost is placed at about $350,000.

MARIETTA, OHIO—The Safe Cabinet Company plans to install electric power equipment in its proposed plant addition, to cost about $750,000. Schenck & Williams, Mutual Home Building, Dayton, are architects.

RUTLAND, OHIO. — The Blackstone Coal Company plans to rebuild its power plant and other building recently destroyed by fire with loss of about $100,000.

SANDUSKY, OHIO.—The necessary government permits have been granted to the Ohio Public Service Company, Cleveland for the construction of a high-tension line across Sandusky Bay, between Gypsum and Bayridge.

ZANESVILLE, OHIO.—The installation of ornamental lamps along the National Highway for 2 miles east and west of Zanesville is under consideration by the city officials in conjunction with the electric light company.

CHICAGO, ILL. — A permit has been granted to the Commonwealth Edison Company to construct a substation at 1122 Ardmore Avenue, to cost about $25,000.

DECATUR, ILL. — Arrangements are being made by the Illinois Power & Light Corporation, Chicago, for the erection of a 66,000-volt transmission line from Decatur to Champaign.

DIXON, ILL. — The Illinois Northern Utilities Company is erecting a transmission line from Shabbona to Steward and Lee, a distance of about 15 miles, to cost about $25,000. Substations will be installed at Stewart and Lee, each to be equipped with three 25-kva. transformers and necessary switching equipment, also distribution system in both places..

JACKSONVILLE, ILL.—Plans are being prepared by H. Shaw, 104 South Michigan Street, Chicago, for a power plant and gymnasium for the Illinois College, to cost about $300,000.

KANKAKEE, ILL. — Electric power equipment will be installed in the proposed local ice-manufacturing plant to be built by the Federal Ice & Refrigerating Company, 142nd Street and Halsted Avenue, Chicago, to cost about $300,000.

QUINCY, ILL.—Negotiations are under way by the Central Illinois Public Service Company, Springfield, for the purchase of the old Central Iron Works plant, adjoining its Front and Yorks Streets property, which it proposes to convert into a power plant.

BARRON, WIS.—The voters have obtained an injunction restraining the City Council from making the proposed extensions to the municipal electric plant. Plans had been approved by the Council to install a Diesel engine to increase the output of the plant, rather than to continue the purchase of surplus power from the Northern States Power Company.

BELOIT, WIS.—Extensions and improvements involving an expenditure of $350,000 are contemplated by the Beloit Water, Gas & Electric Company. The present plans include an addition to the Pleasant Street power plant, which will double the generating capacity, with provision for further extensions, a substation of sufficient output to distribute 66,000 kw., and the erection of a transmission line to connect Beloit with Janesville.

BERLIN, WIS.—The Wisconsin Power & Light Company, Madison, plans to erect a new high-tension line from Berlin to Pine River, and when completed another line to Wild Rose, which will be routed either through Saxeville or Wautoma.

FOND DU LAC, WIS.—The installation of an ornamental lighting system on East Linden Street is under consideration.

KENOSHA, WIS.—Plans have been prepared by the Wisconsin Gas & Electric Company, Racine, for the construction of a new substation, to cost about $100,000, to distribute energy from the 132,000-volt line, now being erected from Racine.

PRAIRIE DU SAC, WIS.—Surveys are being made by the Wisconsin River Power Company, Madison, for the construction of a hydro-electric plant on the Wisconsin River, near Prairie du Sac.

STROUGHTON, WIS.—The City Council has abandoned the plan to issue $30,000 in bonds to finance extensions to the municipal electric plant and will make repairs instead. The erection of an electric line to supply service at McCoombs' Corners is under consideration by the Council.

WAUWATOSA, WIS.—Steps have been taken by the Wauwatosa Commercial Association for improvements to the lighting system in the business district.

CANNON FALLS, MINN. — Plans are being prepared by the Cannon River Hydro Electric Company for the construction of a hydro-electric generating plant, here, to cost about $250,000. The Brahtz Engineering Company, Builders' Exchange Building, St. Paul, is engineer.

CROOKSTON, MINN.—Plans are being prepared by the Red River Valley Power Company for extensions and improvements in its hydro-electric plant No. 1, to cost about $50,000. Roy Croswell, Minneapolis, is engineer.

ROBBINSDALE, MINN. — The Naugle Post & Tie Company, 5 South Wabash Avenue, Chicago, plans to build a power plant at its local properties. James C. Niemeyer, 107 East Third Street, St. Paul, is architect.

Southern States

CHERRYVILLE, N. C. — The Rhyne-Houser Manufacturing Company plans to build a steam-operated electric power plant at its local textile mill.

SNOW HILL, N. C. — Bonds to the amount of $40,000 have been issued by the City Council for a municipal electric light and power plant.

SCOTLAND NECK, N. C.—Bonds to the amount of $25,000 have been issued for extensions and improvements in the municipal electric plant.

HEATH SPRINGS, S. C.—The Heath Springs Light & Power Company, recently organized, plans to install a local light and power system. S. E. Hinson, Heath Springs, heads the company.

BAINBRIDGE, GA.—The property of the Bainbridge Power Company has been acquired by John B. Weakley and Eugene Fies, president and vice-president, respectively of the Alabama Water Company, Birmingham, and Brandon, Gordon & Waddell, bankers, New York City. Extensive improvements are contemplated to the system, which now serves Bainbridge, Donaldsonville, Iron City and other towns in this vicinity.

FITZGERALD, GA.—At an election to be held Sept. 17 the proposal to issue bonds for extensions to the municipal electric and waterworks system will be submitted to the voters.

ROSSVILLE, GA.—Plans for the proposed local mill to be erected by the Peerless Woolen Mills, Inc., at a cost of about $200,000, include an electric power plant. W. H. Sears, James Building, Chattanooga, Tenn., is architect.

PALM CITY, FLA.—The City Council plans to install an electric-lighting plant, for which bonds have been voted.

STUART, FLA.—The Southern Utilities Company is planning to extend its electric service to Riverside Park and Rio St. Lucie subdivisions.

TAMPA, FLA.—The City Commission has approved the petition for the installation of ornamental lamps on Twiggs Street.

WEST PALM BEACH, FLA.—The International Motor Truck Corporation, 25 Broadway, New York, plans to install electric power equipment at its proposed local branch plant, to cost about $200,000.

CHATTANOOGA, TENN.—Plans for rebuilding of the plant of the Willingham Lumber Company, recently destroyed by fire, include a power house.

KNOXVILLE, TENN.—The Cumberland Telephone & Telegraph Company plans an expenditure of $150,000 for the installation of new underground cables, conduits, switchboards, etc., in Knoxville.

FAYETTEVILLE, TENN.—The plant of the Fayetteville Electric Light & Power Company has been acquired by the Southern Cities Power Company, Chattanooga, which plans to erect a transmission line here for local service.

JACKSON, TENN.—Bonds to the amount of $60,000 have been voted for extensions to the municipal electric light plant.

COTTONDALE, ALA.—The installation of an electric plant and water works system in Cottonwood is under consideration.

MOULTON, ALA.—Plans are under way by the Alabama Power Company, Birmingham, for extension of its transmission lines (11,000 volts) from Courtland to Moulton, a distance of 12 miles. A 150-kva. substation and distribution system will be erected here.

WILSON, ARK. — The Wilson Milling Company is planning the erection of a high-tension transmission line connecting Evadale, Basset and Joiner City, to cost about $15,000

CLINTON, OKLA.—Work will soon begin on the construction of a power plant at

the Western State Tuberculosis Sanitarium in Clinton. Jewel Hicks, Braniff Building, Oklahoma City, is architect.

DUKE, OKLA.—The Southwestern Light & Power Company, Oklahoma City, has been granted a franchise to furnish electric service here. Work will begin at once on the erection of a high-tension transmission line to the city and a complete distribution system in the city, which heretofore has not had a lighting service.

HOLLIS, OKLA.—The power plant of the Hollis Light & Ice Company has been acquired by the Southwestern Light & Power Company, which proposes to erect 30 miles of high-tension transmission line to serve the city. The present plant will be held for standby service.

DALLAS, TEX.—Permission has been granted the Dallas Power & Light Company by the City Commission to construct an additional unit in its local power plant, to cost about $2,750,000. The equipment will include a 20,000-kw. turbo-generator. Work will begin on a new substation in Oak Cliff, to cost about $250,000, this fall.

VICTORIA, TEX.—Plans are under way by the Middle West Utilities Company, Chicago, which recently acquired the properties of the Central Texas Power Company, San Antonio, to build a steam-driven electric plant here, to cost between $300,000 and $400,000.

Pacific and Mountain States

BELLINGHAM, WASH. — The Puget Sound Power & Light Company, Seattle, has authorized the erection of a transmission line on the Deming-Glacier Road, about 5 miles.

CENTRALIA, WASH.—The Commissioners of Lewis County have refused to grant the West Coast Power Company, Portland, Ore., a franchise to operate in the Galvin district, west of Centralia.

LA GRANDE, ORE.—The Eastern Oregon Light & Power Company, Baker, plans to build an addition to its local power plant Charles B. Miller, LaGrande, is engineer.

BEVERLY HILLS, CAL.—The Board of Trustees plans to install an ornamental lighting system on portions of Doheny, Almont and Wetherly Drives.

MONTEREY PARK, CAL.—The Board of City Trustees is considering the installation of ornamental lamps on Garvey Avenue. The city engineer is in charge.

PASADENA, CAL.—Plans for the installation of ornamental lamps on East Orange Grove Avenue, between Hill and Allen Avenues, have been approved by the Board of City Directors.

SAN DIEGO, CAL.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Aug. 26 for an electric freight elevator at the local navy yard.

TROY, MONT. — The Great Northern Railroad Company, St. Paul, will soon begin work on the construction of a power plant, at its new local shops, now in course of building. A. H. Hogelund is chief engineer.

DENVER, COL. — The construction of two factories, both to be equipped for electrical operation, has been announced by the officials of the Great Western Sugar Company. The first will be located at Johnstown, and the second at Ovid, where a new town will be established.

Canada

OSHAWA, ONT.—The construction of a local substation, equipped with a 3,000-kva. transformer, to cost about $50,000, is under consideration by the Hydro-Electric Commission of Ontario, Toronto.

OTTAWA, ONT. — The International Paper Company, 100 East Forty-second Street, New York, plans to install electric power equipment in its proposed newsprint mill on the Gatineau River, to cost about $2,000,000.

SIMCOE, ONT.—The erection of a transmission line from Simcoe to Vittoria, to cost about $45,000, is under consideration by the Hydro-Elecric Power Commission of Ontario.

TORONTO, ONT. — Arrangements have been made for lighting the Boulevard Drive and its extension, Fleet Street, between Dufferin Street and York Street. Ornamental lamps now in use on the western section of the boulevard will be continued through the Exhibition Grounds to the eastern entrance, and from there to John Street and eventually to Bay Street. 200-watt nitrogen lamps will be installed.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 14, 1925)

1,546,097. SPEED AND DIRECTION INDICATOR FOR SHAFTS; S. Mills, Oakland, Cal., and T. G. Plant, Sausalito, Cal. App. filed Dec. 18, 1922.

1,546,113. TELEPHONE SYSTEM; W. P. Albert, East Orange, N. J. App. filed Aug. 27, 1923. Machine switching.

1,546,148. MULTIPLE OUTLET SOCKET; G. F. Smallwood, Kansas City, Mo. App. filed Dec. 26, 1922.

1,546,168. RAIL CHAIR WITH COMBINED NUT LOCK AND ELECTRIC BOND; A. E. Crouch, Indianapolis, Ind. App. filed June 8, 1923.

1,546,172. ELECTRIC SWITCH; J. D. Hilliard, Schenectady, N. Y. App. filed March 23, 1923. Oil-break type for controlling high-potential circuits.

1,546,173. ELECTRIC SWITCH; H. J. Huber, Schenectady, N. Y. App. filed March 2, 1923. Oil-break type in which the final break occurs between contacts arranged in an explosion chamber.

1,546,193. LIVE PICTURE PRODUCTION; A. Bissiri, Los Angeles, Cal. App. filed Aug. 7, 1922. Apparatus for projection.

1,546,213. INSULATOR SUPPORT; R. E. Duffy, Clinton, Mo. App. filed Dec. 20, 1923. To be used at the tops of poles in place of the usual crossarms.

1,546,234. ELECTRICAL APPARATUS; R. Hannah, Schenectady, N. Y. App. filed Dec. 15, 1923. For automatically generating and maintaining the pressure of a gas as hydrogen used for cooling apparatus.

1,546,250. CLAMP BAR FOR ELECTRIC WELDING MACHINES; B. B. Phillips, Hudson, N. Y. App. filed July 8, 1923.

1,546,269. SELF-STARTING SYNCHRONOUS MOTOR; H. E. Warren, Ashland, Mass. App. filed Sept. 11, 1922. Miniature type.

1,546,272. ELECTRIC SWITCH; W. E. Wedeman, Baltimore, Md. App. filed Aug. 29, 1921. Combined clip-block and terminal for high-capacity switches.

1,546,308. MECHANICAL INTERLOCK; G. Page, Hove, England. App. filed Dec. 19, 1923. For switches.

1,546,310. TELEGRAPHONE; J. Paulas, New York, N. Y. App. filed May 28, 1923. Automatic, so as to enable a message to be received and recorded when the person called is absent.

1,546,311. TELEPHONE RETURN TIME SIGNAL; A. R. Patterson and S. J. Tomlinson, Jr., Fairland, Ind. App. filed Aug. 10, 1923.

1,546,349. X-RAY DIFFRACTION APPARATUS; A. W. Hull and W. P. Davey, Schenectady, N. Y. App. filed Oct. 10, 1921.

(Issued July 21, 1925)

16,121 (reissue). ALTERNATING CURRENT DYNAMO ELECTRIC MACHINE WINDING; C. MacMillan, Schenectady, N. Y. App. filed Aug. 8, 1924. Substantially free from detrimental harmonics.

1,546,392. TESTING APPARATUS; R G. McCurdy, Cresskill, N. J. App. filed June 10, 1920. For detecting the presence on series lighting circuits of transformers having open-circuited secondaries.

1,546,395. DUPLEX SIGNALING SYSTEM; W. H. Martin, New York, N. Y. App. filed Jan. 17, 1920.

1,546,407. TRAIN-ANNOUNCING SYSTEM; E. A. Reynolds, Weehawken, N. J. App. filed Dec. 17, 1919.

1,546,410. ELECTRIC ARC-WELDING APPARATUS; A. Schneider, Brooklyn, N. Y. App. filed May 25, 1923. Clamp holder.

1,546,427. AUXILIARY SIGNALING CIRCUITS; H. A. Affel, Brooklyn, N. Y. App. filed May 18, 1921. For transmitting auxiliary signals over long toll wire or carrier telephone circuits.

1,546,432. RELAY AND CIRCUITS THEREFOR; D. E. Branson, Bloomfield, N. J. App. filed June 21, 1924. Vibrating armature type.

1,546,433. ELECTRIC SWITCH; G. A. Burnham, Saugus, Mass. App. filed June 22, 1920. High-capacity, oil-immersed type.

1,546,439. SECRET TELEPHONE SYSTEM; L. Espenschied, Queens, N. Y. App. filed Jan. 8, 1920.

1,546,440. APPARATUS FOR AMPLIFYING; R. A. Fessenden, Brookline, Mass. App. filed Dec. 24, 1918. Signalling purposes.

1,546,470. ELECTRICAL RELAY; S. G. Brown, North Acton, England. App. filed Aug. 28, 1922. For use in the amplification of telephone speech currents.

1,546,474. ELECTRIC SWITCH AND HANDLE; E. L. Connell, Cleveland, Ohio. App. filed Aug. 11, 1921. For portable tools.

1,546,496. ELECTRIC SWITCH; H. E. Leppert, New Britain, Conn. App. filed June 21, 1921. Four-way type.

1,546,501. TRAFFIC-SIGNAL DEVICE; M. L. Martus, Woodbury, Conn. App. filed March 14, 1923. Portable; adapted to be illuminated by a battery-operated electric lamp.

1,546,504. PHOTO ELECTRIC SYSTEM; O. B. Moorhead, San Francisco, Cal. App. filed March 10, 1919.

1,546,505. ELECTROMAGNET DEVICE; J. H. Muth, East Cleveland, Ohio. App. filed Aug. 27, 1923. As used in telephones.

1,546,533. SOAKING PIT; T. F Baily, Alliance, Ohio. App. filed March 18, 1924.

1,546,534. ELECTRIC FURNACE; T. F. Baily, Alliance, Ohio. App. filed Aug. 28, 1923. Refractory type.

1,546,535. ELECTRIC SOAKING PIT; T. F. Baily, Alliance, Ohio. App. filed March 18, 1924.

1,546,579. DUAL SYSTEM OF CONTROL FOR DIRIGIBLE DEVICES; J. H. Hammond, Jr., Gloucester, Mass. App. filed Oct. 14, 1915. Either by electromagnetic radiant energy or by sound waves.

1,546,591. CUSHION-HEAD INSULATOR PIN; W. D. Kyle, Milwaukee, Wis. App. filed Nov. 15, 1922.

1,546,605. SWITCH WITH TIMING DEVICE; C. F. Norden, New York, N. Y. App. filed July 19, 1920. To maintain current to the apparatus for an adjusted time interval after the switch is turned off.

1,546,607. MOTION PICTURE ARC LAMP; H. W. Prettyman, Inwood, W. Va. App. filed June 21, 1921.

1,546,615. CHIME SWITCH; A. S. Boehm, Baltimore, Md. App. filed Oct. 10, 1921. For controlling church chimes.

1,546,639. METHOD OF AND APPARATUS FOR THE RECEPTION OF RADIOSIGNALS; C. L. Farrand, Elizabeth, N. J. App. filed May 14, 1919. Particularly signals of undamped waves.

1,546,696. VACUUM TUBE; J. F. Yates, Massillon, Ohio. App. filed Aug. 7, 1922. Using alternating current to heat the filament.

1,546,720. MAGNETIC MOTOR; R. H. Davis, Dow, Okla. App. filed July 7, 1920.

1,546,749. TELEPHONE TRANSMITTER; J. G. Roberts, Dobbs Ferry, N. Y. App. filed Nov. 3, 1921.

1,546,776. MANUFACTURE OF FILAMENTS FOR ELECTRIC LAMPS, THERMIONIC TUBES, AND THE LIKE; W. R. Bullimore, London, England. App. filed Nov. 24, 1924.

1,546,780. ADAPTER FOR TELEPHONE CALLING DEVICES; J. Erickson, Chicago, Ill. App. filed Jan. 22, 1923.

1,546,781. METHOD OF AND APPARATUS FOR THE RECEPTION OF RADIOSIGNALS; C. L. Farrand, South Beach, Conn. App. filed Oct. 13, 1919. Particularly signals of undamped waves.

1,546,802. DISCONNECTING SWITCH; A. G. Steinmayer, Chicago, Ill. App. filed July 28, 1923. Adapted for remote control.

1,546,839. GROUND CLAMP; E. L. Klingel, West St. Paul, Minn. App. filed April 2, 1923.

1,546,855. STATIONARY INDUCTION APPARATUS; V. M. Montsinger, Pittsfield, Mass. App. filed June 13, 1921. Small transformer for domestic use.

1,546,856. ELECTRIC SWITCH MECHANISM; H. J. Morey and D. N. Thompson, Syracuse, N. Y. App. filed May 14, 1921. Key switches as used in lamp sockets.

1,546,864. ELECTRIC BRAKE; T. B. Patch, Brookline, Mass. App. filed June 8, 1922. For vehicles.

1,546,865. ELECTRIC GENERATING SYSTEM; R. B. Purington and C. W. Place, Chicago, Ill. App. filed May 22, 1923. Automatic control of hydro-electric generating plants.

1,546,873. ALARM DEVICE FOR ANNOUNCING INTERRUPTIONS IN ELECTRCIAL SAFETY PLANTS; E. Volkers, Berlin-Lankwitz, Germany. App. filed Dec. 15, 1923. As burglar alarm systems.

1,546,875. ELECTRON DISCHARGE APPARATUS; J. C. Warner, Schenectady, N. Y. App. filed July 11, 1924. Of the thermionic type having at least four electrodes.

1,546,878. RADIO RECEIVING SYSTEM; E. F. Alexanderson, Schenectady, N. Y. App. filed June 7, 1921. Simultaneous reception of a plurality of signals upon a single receiving antenna.

1,546,879. AUTOMATIC RECLOSING CIRCUIT BREAKER SYSTEM; A. E. Anderson, Schenectady, N. Y. App. filed Aug. 8, 1923.

1,546,885. TRANSFORMER CORE; L. H. Burnham, Pittsfield, Mass. App. filed Dec. 31, 1923.

Financial and Corporate

Utility Market Irregular

Insull's Warning Depresses Stocks, but Small Recoveries Take Place Later

THE outstanding event of the week under review so far as the market in power and light stocks was concerned was the warning sounded by Samuel Insull of Chicago that some of the utility issues were rising to unwarranted heights. For a day or two the whole list turned distinctly weak, the stock of Mr. Insull's own company, Middle West Utilities, leading in the decline. Soon a more optimistic tone developed in the market, however, and the decline was checked for the most part. Although some rallies were recorded later in the week, the net changes for the week showed a mixture of gains and losses.

While both losses and gains were registered for the week, it must be said that the majority of significant changes represented advances rather than declines. An announcement of a split-up in Southeastern Power & Light Company's common shares tended to offset somewhat the bad effects of Mr. Insull's statement on the market. Southeastern issues rallied on the news of a five-to-one split, and trading became active in the new shares dealt in on a "when issued" basis. Southeastern did not maintain its first show of strength, but closed the week more than four points above its level of the week before. A five-point gain was made by Western Power and a three-point gain by American Light & Traction.

Among the issues that did best in the unlisted market were General Gas & Electric, Power Corporation of New York, Southern California Edison and United Light & Power.

New Capital Issues

Four new public offerings of electric light and power securities were made during the week ended August 20 by investment houses. The ten-million-dollar issue of 6 per cent debentures of the Southeastern Power & Light Company, which in the last number of the ELECTRICAL WORLD were announced as sold to Bonbright & Company, was offered the investing public at 96½ and accrued interest, to yield over 6.20.

The United Light & Power Company, another representative of new financing during the week, made an offering of 30,000 shares of cumulative class A $6.50 preferred stock, first series, the price being $94 per share and accrued dividend, to yield over 6.90.

The Mississippi Power Company, a subsidiary of the Southeastern Power & Light Company, floated a four-million-dollar loan in the form of first and refunding mortgage gold bonds priced at 92½ and interest, yielding over 5.50 per cent.

The Western Public Service Company offered 5,000 shares of first preferred 7 per cent cumulative stock at $96 per share and accrued dividened, to yield about 7.29 per cent.

Company Reports

The following statements of earnings were issued during the past week by electric light and power companies for the month of July:

Name of Company	Gross Earnings for July 1925	1924
Adirondack Power & Light....	$641,716	$535,871
Detroit Edison*.....	2,832,407	2,418,787
Public Service Corp. of N. J...	7,164,852	6,769,312

*Includes other revenue.

Dividends Declared

The quarterly dividends listed below were announced during the past week by electric light and power companies and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Power & Light, com.....	0.25	Sept. 1
Beloit Water, Gas & Elec., pf.....	1¾	Oct. 1
Central Ill. Public Service, pf.....	$1.50	Oct. 15
Central Indiana Pwr. pf.....	1¾	Sept. 1
Cities Service, bankers' shares.*...	14.81c	Sept. 1
Laclede Gas Light, com.....	2	Sept. 15
Mascoma Lt. & Pwr., com.....	2	Sept. 1
Mascoma Lt. & Pwr., pf.....	1¾	Sept. 1
Middle West Utilities, pr. lien.....	$1.75	Sept. 15
Nebraska Power, pf.....	1¾	Sept. 1
No. Amer. Utility Securities, first pf. allotment ctfs.....	$1.50	Sept. 15
Northern States Pwr. of Wis., pf...	1¾	Sept. 1
Northern Texas Electric, com.....	2	Sept. 1
Northern Texas Electric, pf.....	3	Sept. 1
Oklahoma Gas & Elec., pf.....	1¾	Sept. 15
Philadelphia Electric, com.....	.50	Sept. 15
Philadelphia Electric, pf.....	.50	Sept. 15
Southwestern Pwr. & Lt., pf.....	1¾	Sept. 1
Standard Gas & Elec., pf.....	2	Sept. 15
Wisconsin Pwr. & Lt., pf.....	$1.75	Sept. 15
Vesta Battery, pf.....	1¾	Sept. 1

*Monthly.

Weston Electrical Instrument Corporation.—The Weston Electrical Instrument Corporation reports net income for the quarter ended June 30 amounting to $177,048 after all deductions, equal to $1.01 a share on 100,000 shares of class A stock, and 76 cents a share on 100,000 shares of no-par-value common. The net income was $165,064 in the first quarter of the year, equal to 95 cents a share on the class A stock and 70 cents a share on the common.

Potomac Company Authorized Substantial Increase in Capital.—The Public Utilities Commission of the District of Columbia has authorized the Potomac Electric Power Company to increase its capital stock to $30,000,000, to consist of 200,000 shares of preferred non-voting cumulative stock of the par value of $100 each and 100,000 shares of common stock of the par value of $100 each. The company in its application stated that this increased capital was to provide in a comprehensive way for financing over a long period of years, and that there was no intention on the part of the company to issue stock immediately, and probably not more than $2,000,000 of preferred stock within the near future.

Utility to Increase Dividend.—Directors of the Southern Cities Utilities Company have authorized the treasurer of the company to increase at his discretion the annual dividend on the common stock to $4 a share. This increase will probably be made in the October 10 payment, making the third and fourth quarterly dividends $1.25 each. The stock has a par value of $100 a share.

English Electric Annual Report.—The annual report of the English Electric Company of Canada, Ltd., shows that the company made steady progress throughout the past year. The profits for the year, before providing for depreciation, were $95,092, against $75,659 in the previous year. After allowing $40,000 for depreciation, the net profits were $55,092, as compared with $35,659. The profits added to profit and loss account brought the total up to $319,844, against $264,752. The company has a reserve for depreciation of $379,719 and a reserve for contingencies of $20,000.

Colorado Company Reclassifies Stock.—The stockholders of the Southern Colorado Power Company have voted an increase in the number of shares and authorized the reclassification of the capital stock by providing (a) that the capital stock shall consist of the present authorized 40,000 shares of 7 per cent cumulative preferred stock, par $100; 250,000 shares of class A common stock, par $25, and 200,000 shares of class B common stock, no par value; (b) that each share of the present outstanding 8 per cent second preferred stock, par $100, be converted into four shares of class A common stock; (c) that each share of present common be converted into one share of class B common stock.

Securities of Maine Corporations Also Legal Bank Investments.—The list of securities approved by the Bank Commissioner of the State of Maine as legal investments for savings banks that was published in the August 1 issue of the ELECTRICAL WORLD, did not include the securities of Maine utilities like the Central Maine Power Company and others doing business in Maine. The Bank Commissioner's announcement states: "It should be noted that the list does not include bonds and stocks of Maine corporations named under paragraph IX and X, of which the statute does not require certification. The necessary qualifying factors in such cases must be ascertained by the purchasing bank. All questions of interpretation of the statute in cases of doubt should be taken up with the department in advance of purchase."

Listings.—The New York Stock Exchange has authorized the listing of $30,000,000 first lien and refunding mortgage 5 per cent gold bonds, series B, of the New York Edison Company, and the Philadelphia Stock Exchange has authorized the listing of $1,811,850 additional common stock of the United Gas Improvement Company, that amount

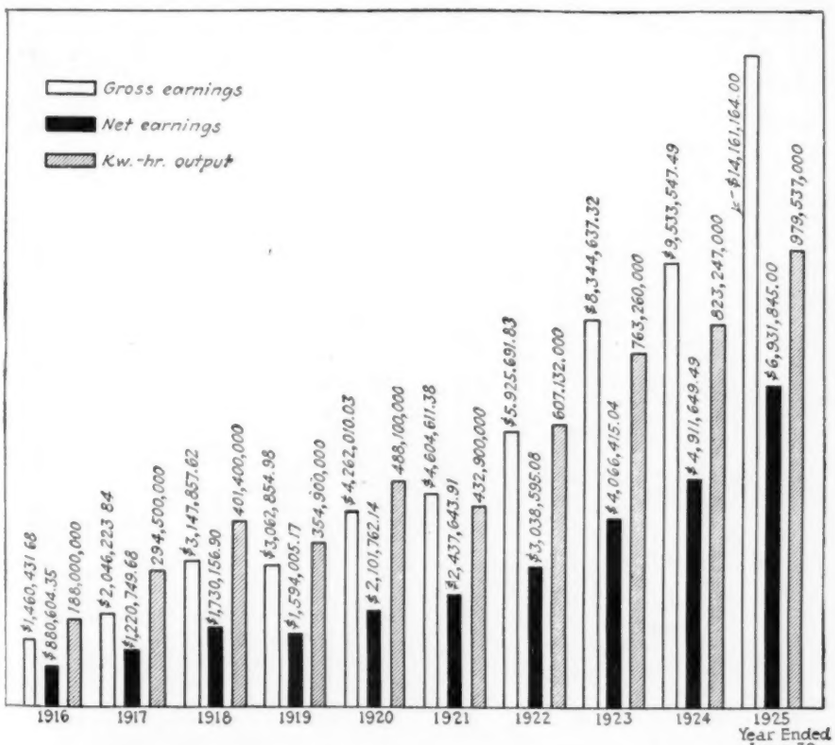
being the balance of $6,713,300 applied for listing last June. There have been added to the list of the Boston Stock Exchange 19,365 shares of common stock, 11,850 shares of preferred stock, 1,758 shares of preferred B stock and 781 shares of preferred BB stock of the Cities Service Company. There were also added 18,288 shares (par 20) of common stock issued as a stock dividend of one-half of 1 per cent to stockholders of record July 15.

Southeastern's New Financial Plan

Company Spreads Wings to Cover New Properties and Lays Plans for Retirement of Its Entire Funded Debt Except Hundred-Year Debentures

By Paul Willard Garrett

WHEN the Southeastern Power & Light Company was formed in September, 1924, to take over the assets of the old Alabama Traction, Light & Power Company, Ltd., of Canada, the new company assumed the obligation to pay principal and interest on $13,668,900 of 5 per cent bonds outstanding in the hands of the public bonds pledged under the notes. In that way the management reckoned that it could prepare the way for the conversion, par for par, of the Traction bonds into an equal principal amount of 6 per cent debentures of Southeastern. Not all details of this plan have been announced, but a meeting of the bondholders has been called to consider



Southeastern Power & Light Company's System Shows Substantial Progress

against the Traction company. It was thought then that the Traction company bonds eventually would be converted into securities of Southeastern. Thomas W. Martin, president of the Southeastern Power & Light Company and long associated in the management of the properties, last week announced the plans by which it is proposed to work the old Traction bonds into the new capital structure.

Southeastern has just sold on the open market a ten-million-dollar issue of 6 per cent gold debentures, series A, due September 1, 2025. The proceeds of the loan will be used to retire a seven-and-a-half-million-dollar issue of five-year secured 6 per cent notes offered by the Southeastern Power & Light Company and thus release the Traction it. The plan includes the proposal to issue warrants with the new debenture bonds, giving holders a perpetual call on Southeastern common.

The ten-million-dollar issue of debentures due in 2025, which were offered to the public at 96½, or to yield 6.20 per cent, met a popular demand in investment circles and was immediately oversubscribed. In addition to the intrinsic position of the debentures that is suggested by the fact that earnings of the company for the twelve months ended June 30, 1925, equaled two and three-tenths times all interest requirements, the new obligations have a speculative flavor. Each debenture carries option warrants in the ratio of ten warrants for each thousand-dollar bond. Each option warrant entitles the holder to purchase one share of the proposed new common stock at any time for $50, or if the proposed exchange of common stock is not effected, five such warrants will entitle the holder to purchase one share of the present stock at $250.

At the same time the management is suggesting a division of the common shares into smaller units through its proposal to issue new common stock so that five shares will be outstanding for each share now outstanding. The present stock, being of no par value, will not be retired, but each share will receive an additional four shares, so when the plan is put into effect the man who holds 100 shares of the present stock will find himself the possessor of 500 shares of new. The market movement of the present stock from around 35 last fall to 155 recently has raised it to the position of a rich man's stock. The management feels that public interest in the stock and the demand for small blocks from the company's own customers make it advisable to divide the shares into smaller pieces and thus assure the issue of a wide distribution. The new shares are quoted around 32 on a "when issued" basis.

Southeastern owns or controls through stock ownership five power and light companies—(1) Alabama Power Company, (2) Mississippi Power Company, (3) Gulf Electric Company, (4) Mobile Electric Company and (5) Pensacola Electric Company.

On completion of the present financing the Southeastern Power & Light Company will be free from funded debt except for its debentures that bear a maturity date a hundred years distant. Its capital structure will be simple. Fixed obligations will consist only of a $23,668,900 issue of hundred-year debentures. Following these will come 19,373 shares of no-par-value seven-dollar cumulative preferred stock and 1,700,000 shares of no-par-value common. In addition, there will be outstanding 473,378 warrants carrying the right to purchase common stock at $50 a share.

Protective Agreement Formed for Vermont Utility.—For the better protection of stockholders' interest a stock trust agreement has been formed for the Montpelier & Barre Light & Power Company, one of the Charles H. Tenney & Company group of utilities. Trustees under the agreement are Charles H. Tenney, Horace P. Wood and Matthew Lahti. The ageement runs ten years, is subject to termination at any time by the trustees, and if it is desired to extend the trust for another five years it can be done on written approval of three-fourths in interest of the depositing stock. The Montpelier & Barre Light & Power Company has outstanding 2,750 shares of 7 per cent prior preference stock, 13,378 shares of 6 per cent preferred and 10,000 shares of common, all $100 par. The holders of all classes are invited to deposit their stock with the American Trust Company, Boston, as agent for the trustees. It is provided in the agreement that the trustees may sell all of the deposited stock, but not a part thereof, at such price and terms as approved in writing by three-fourths in interest of each class of stock.

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

Companies	Bid Price Saturday, Aug. 15	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Pwr. & Lt.—7%	100	98	106
Adirondack Pwr. & Lt.—8%	108	103	115
Appalachian Pwr.—7%	98	92	100
Appalachian Pwr. 1st pf.—7%	100	95	101
Arizona Pwr.—7%	79	75	87
Arkansas Lt. & Pwr.—7%	98½	92	102
Asheville Pwr. & Lt.—7%	f101½	101	102½
Central Ill. Pub. Serv.—6%	85	84	93
Cleveland Elec. Illg.—6%	102	101	105
Colo. Pwr.—7%	95	93	98
Conn. Lt. & Pwr.—8%	115	115	118
Conn. Lt. & Pwr. —7%	106	105	110
eCon. Gas, El. Lt. & Pwr.—6½%	110½	105	110½
Cons. Gas, El. Lt. & Pwr.—8%	124	123	126
Cons. Gas, El. Lt. & Pwr.—7%	109	108	112
Consumers' Pwr.—6%	94½	90	97
Dayton Pwr. & Lt.—6%	94	88	100
Dubuque Elec.—6%	90	80	90
Duquesne Lt.—7%	f109½	105	111¾
East. Tex. Elec.—6%	100	100	105
Empire Dist. Elec.—6%	78	78	85
Ft. Worth Pwr. & Lt.—7%	f102	101½	103
Georgia Ry. & Pwr.—4%	95	62	90
Gt. West. Pwr.—7%	99	....	....
Ia. Ry. & Lt.—7%	97	92	100
Ill. North. Utilities—6%	88	82	92
Ill. Pwr. & Lt.—7%	95½	92½	98
Interstate Pub. Serv.—7%	96	90	100
Kans. Gas & Elec.—7%	f102	101½	102½
Long Island Lighting—7%	104	100	105
Los Angeles Gas & Elec.—6%	94	90	97
Milwaukee Elec. Ry. & Lt.—8%	100	98	105
Milwaukee Elec. Ry. & Lt.—7%	97½	96	105
Milwaukee Elec. Ry. & Lt.—6%	86	83½	87
Minn. Pwr. & Lt.—7%	f100	100	101
Miss. River Pwr.—6%	92	87½	94
Nebraska Pwr.—7%	102½	102	103½
N. J. Pwr. & Lt.—7%	f102	92	102
New Orleans Pub. Serv.—7%	99	94	102
N. Y. Central Elec.—7%	100	96	101
Niagara Falls Pwr.—7%—25	28½	27¾	29
Niagara, Lock. & Ont. Pwr.—7%	107	101½	110
No. Caro. Pub. Serv.—$7—no par	91	90	96
No. Ohio Trac. & Lt.—6%	73	64	75
North. States Pwr.—7%	100	95	100
Ohio Gas & Elec.—7%	90	87	100
Ohio Pwr.—6%	91	85	95
Ohio Pub. Serv.—7%	97	97	100
Pac. Gas & Elec.—6%	96	92	99
Pac. Pwr. & Lt.—7%	f101½	101	102½
cPenn Central Lt. & Pwr.—no par	70	60	70
Penn-Ohio Pwr. & Lt.—7%	93	91	100
Penn-Ohio Pwr. & Lt.—8%	104	101	110
Penn. Pub. Serv.—7%	90	90	100
Penn Pub. Serv.—6%	80	80	90
Penn. Pwr. & Lt.—$7—no par	f103½	103	104
cPhila. Elec.—8%—25	43½	37½	45
Portland Elec. Pwr.—7%	97	95	99
Portland Elec. Pwr.—6%	68	70	80
Pwr. Corp. of N. Y.—7%	99	96	102
Pub. Serv. of No. Ill.—6%	108	90	97
Pub. Serv. of Okla.—7%	94	87	95
Pub. Serv. Elec. & Gas—6%	f 97	92½	97
Puget Sound Pwr. & Lt.—7%	102	102½	107
Rochester Gas & Elec.—5%	105	80	98
So. Calif. Edison—8%	127	115	128
So. Calif. Edison—7%	109	105	107½
So. Calif. Edison—6%	96	90	95½
Tenn. Elec. Pwr.—6%	85	80	85
Tenn. Elec. Pwr.—7%	98½	93	103
Tenn. Elec. Pwr.—$6—no par	80	72	84
Tex. Pwr. & Lt.—7%	f102½	102	104
Toledo Edison—8%	110	109	114
Toledo Edison—7%	101	94	101½
Utah Pwr. & Lt.—7%	f100½	100	101½
Utica Gas & Elec.—7%	101	100	104
Vermont Hydro-Elec.—7%	90	87	96
Virginia Pwr.—7%	102	94	107
West Penn—7%	f 98	94	100
West. States Gas & Elec.—7%	89	82	92
Wis.-Minn. Lt. & Pwr.—7%	90	92	95
Yadkin River Pwr.—7%	f102	102	103
Holding Companies			
Amer. & Foreign Pwr.—7%	f 90½	87	94
cAmer. Elec. Pwr.	100	96	104½
Amer. Gas & Elec.—6%—no par	89	85	91
Amer. Lt. & Trac	101	93	101½
Amer. Pwr. & Lt.—6%	93½	84	91½
Amer. Pub. Serv.—7%	98	88	94
Amer. Pub. Utilities—5%	78	71	82
Amer. Pub. Utilities—7%	89	87	95
Amer. Water Wks. & Elec.—6%	104	95½	110½
Amer. Water Wks. & Elec.—7%	98	97¼	103
Assoc. Gas & El.—7%—1% extra—50	f 52	....	....
Assoc. Gas & Elec.—$6—no par	84	....	....
Carolina Pwr. & Lt.—$7—no par	104	100	107
Central Ark. Ry. & Lt.—7%	97	91	98½
Central Ind. Pwr.—7%	90	88	95
Central States Elec.—7%	96	87	98
Cities Serv.—6%	83	80	84
Columbia Gas & Elec.—7% pf.	109¾	104½	110½
Commonwealth Pwr.—6%	81	80	85½
Continental Gas & Elec.—7% pfc. pf.	93	85	97
Continental Gas & Elec.—7% pr. pf.	93	89	95
Elec. Bond & Share—6%	f104	104	105½
Elec. Investors—7%	93	90	100
Elec. Pwr. & Lt., ctfs.	f 91½	90	94
Elec. Pwr. & Lt., ctfs. 40% pd.	f107	100	110
Galveston-Houston Elec.—6%	68	70	75
Gen. Gas & Elec.—6%	225	72	240
Gen. Gas & Elec.—7%	150	120	....
Gen. Gas & Elec.—$7—no par	150	90	175
Gen. Gas & Elec.—$8—no par	160	104½	180
Georgia Lt., Pwr. & Rys.—6%	80	74	85
Jersey Central Pwr. & Lt.—7%	97	90	96
aMiddle West Utilities—7%	96¾	91½	98¾
Middle West Utilities—pr. lien 7%	105	98	108
Natl. Lt., Ht. & Pwr.—5%	62	40	65
Natl. Pwr. & Lt.—$7—no par.	98	95	99
No. Amer.—6%—50	f 49½	46½	50½
No. Tex. Elec.—6%	55	60	75
Penn-Ohio Elec.—7%	96	83½	96
Phila. Co.—50	49	45½	49
Pub. Serv. Corp. of N. J.—7%	f104	99	104
Pub. Serv. Corp. of N. J.—8%	114	108¾	115½
Southeastern Pwr. & Lt.—7%	97	90	100
Southern Cities Utilities—7%	84	77	100
Southwestern Pwr. & Lt.—7%	100	90	102
Standard Gas & Elec.—8%	53½	....	....
Standard Gas & Elec.—7%	98½	96	100
Standard Pwr. & Lt.—7%	109	95	114½
United Gas & Elec.—5%	91	80	94
cUnited Gas Improv.—50	96½	79½	100
United Lt. & Pwr.—$4—no par	50	41	51
United Lt. & Pwr.—$6.50—no par	93	83	99
Western Pwr. Cor.—7%	88	84	95½
COMMON STOCKS			
Operating Companies			
Adirondack Pwr. & Lt.—50	88	31	98
Appalachian Pwr.—no par	78	70	83
Arizona Pwr.	25	15	33
Arkansas Lt. & Pwr.	100	65	101
Brooklyn Edison	f138	120½	140½
Buffalo Gen. Elec	65	44	73½
Cleveland Elec. Illg.	240	200	250
aCommonwealth Edison	138	130½	141½
eConsol. Gas, Elec. Lt. & Pwr.	44½	32	45
Dayton Pwr. & Lt.	400	180	460
Detroit Edison	f129	110	134½
Eastern Tex. Elec.	68	70	75½
dEdison Elec. Illum. of Boston	g201	200	213
Georgia Ry. & Pwr.	100	62	102
aKy. Hydro.-Elec.	90	85½	92½
Long Is. Light	105	60	105
Miss. River Pwr.	64	37	68
Montana Pwr.	f 93	64	99½
New Orleans Pub. Serv.—no par	33	31	38½
Niagara Falls Pwr.—no par	61	45½	77
Niagara, Lock. & Ont. Pwr.—no par	65	60	73
North. Ohio Pwr.	11	5	13½
North. States Pwr.	118	103	125
Pacific Gas & Elec.	f113¾	102½	118½
ePenn. Wtr. & Pwr.	185	126½	185
cPhila. Elec.—25	43¾	37¾	47⅝
Portland Elec. Pwr.	36	40	53
Pwr. Corp. of N. Y.—no par	81	15	89½
Pub. Serv. Co. of No. Ill.	118	97	124
Puget Sound Pwr. & Lt.	53	49	61
So. Calif. Edison	118	102	139
Tenn. Elec. Pwr.—no par	60	47	69
Toledo Edison	25	21	25
Utica Gas & Elec.	200	100	200
Virginia Pwr.	66	65	92
Virginia Ry. & Pwr.	g123½	64½	123½
West Penn	120½	105	145
Holding Companies			
Amer. & Foreign Pwr.—no par	f 44	27½	47
Amer. Gas & Elec.—no par	77	70	85
Amer. Lt. & Trac.	213	139	220
Amer. Pwr. & Lt.	56	52	67
Amer. Pub. Serv.	85	45	90
Amer. Public Utilities	98	70	103
Amer. Wtr. Wks. & Elec.	f 61½	34¾	68½
Assoc. Gas & Elec., Class A	f 44¾	....	....
Carolina Pwr. & Lt.—no par	390	290	430
Central States Elec.	120	70	102
Cities Service (new)	38½	34	43
Columbia Gas & Elec.—no par	f 74¾	45½	74¾
Commonwealth Pwr. Corp—no par	140	106	173
Cons. Gas—no par	f 89¾	74½	92⅞
Continental Gas & Elec.	135	77	99
Elec. Bond & Share Sec.	f 66	66½	67½
Elec. Investors	59	30	66
Elec. Pwr. & Lt., ctfs.	f 34	17¾	40½
Federal Lt. & Trac.	f 29½	26¼	36
Galveston-Houston Elec.—no par	20	32	40
General Gas & Elec.	220	72	240
Georgia Lt., Pwr. & Rys.	68	25	74
Georgia Ry. & Pwr.	100	62	102
Jersey Central Pwr. & Lt.	45	15	50
Lehigh Pwr. Securities—no par	137	82	155
aMiddle West Utilities—no par	108½	82½	125
aNational Elec. Pwr.	95½	94	96¾
Natl. Lt., Ht. & Pwr.	11	11	....
Natl. Pwr. & Lt.—no par	331	185	357
North. Tex. Elec.	40	40	70
No. Amer.—10	f 57⅜	41½	60¾
Phila. Co.—50	f 58½	51½	62¾
Pwr. Securities—no par	15	....	....
Pub. Serv. Corp. of N. J.—no par	f 82½	62⅜	87¾
Republic Ry. & Lt.	66	49	65
Southeastern Pwr. & Lt.	153	45	158
Southern Cities Utilities	60	30	71
Standard Gas & Elec.—no par.	f 56½	40½	59¾
United Gas & Elec. (Conn.)—no par	45½	26	49
United Lt. & Pwr.—A—no par	133	42	138
United Lt. & Pwr.—B—no par	170	49	100
Western Pwr. Corp.—no par	57	34	68
BONDS			
Operating Companies			
Adir. Pwr. & Lt.	6s 1950	104	102½	105½
Ala. Pwr.	5s 1946	98½	96	100
Appalachian Pwr.	5s 1941	97	96	99¾
Brooklyn Edison	5s 1949	101⅜	99½	103
	6s 1930	104½	103¾	105½
Cleveland Elec. Illum.	5s 1939	101	100	102
Com'wealth Edison.	5s 1943	102	99½	102¾
	5s 1953	99	98½	101
eConsol. Gas Elec. Lt. & Pwr.	4½s 1935	97½	93½	97¾
	6s 1949	107½	104⅜	107¾
Consumers' Pwr.	5s 1936	99½	99	100⅜
	5s 1952	95½	90⅜	100
Detroit Edison	5s 1933	101½	99⅜	102½
Duquesne Lt.	6s 1949	106	104½	107¾
Great Western Pwr.	5s 1946	97½	95	99¼
Kansas City Pwr. & Lt.	5s 1952	98⅜	95½	101
Miss. River Pwr.	5s 1951	98	96½	100¼
Montana Pwr.	5s 1942	99½	97½	100⅜
New Eng. Pwr.	5s 1951	101	100¼	103
N. Y. Edison	6½s 1941	113	112	115½
Niagara Falls Pwr.	6s 1932	104	103¼	106½
No. States Pwr.	5s 1941	95⅜	93	99¼
No. States Pwr.	6s 1941	104¼	103	107½
Ohio Pwr.	7s 1951	106	106¼	107½
Pacific Gas & Elec.	5s 1942	95	93½	99
ePenn. Wtr. & Pwr.	5s 1940	99½	99¼	102
cPhil. Elec.	5s 1966	102½	100	103½
	5½s 1947	105¼	103½	107
	6s 1941	106⅜	106	108⅜
Portland Elec. Pwr.	6s 1947	99¾	96½	100
So. Cal. Edison	5s 1939	98	99½	101
	6s 1944	103	102½	105½
Tenn. Elec. Pwr.	6s 1947	102⅜	99¼	104½
Tex. Pwr. & Lt.	5s 1937	98	97	99½
Toledo Edison	7s 1941	109	108⅜	110
Utah Pwr. & Lt.	5s 1944	94½	91	98½
Holding Companies				
Ala. Trac. Lt. & Pwr.	5s 1962	98½	86	99½
Amer. Gas & Elec.	6s 2014	97½	96½	98½
Amer. Pwr. & Lt.	6s 2016	96	94	98
Am. Wtr. Wks. & Elec	5s 1934	95½	92½	98
Assoc. Gas & Elec.	6½s 1954	f103½	....	....
Central Ind. Pwr.	6s 1947	97	95½	99¼
Commonwealth Pwr.	6s 1947	102½	97⅛	103⅜
Consol. Cities Lt., Pwr. & Tr.	5s 1962	79½	75½	82½
Ill. Pwr. & Lt.	6s 1953	100¼	100½	102¼
United Lt. & Rys.	5s 1932	94⅜	93½	97½
	6s 1952	97½	95⅝	100½
ELECTRICAL MANUFACTURING COMPANIES				
PREFERRED STOCKS				
Allis-Chalmers Mfg.		105½	103¾	108
*National Carbon		126	120	130
bWagner Elec.		80	79	91
West. Elec. Instrument—A		f 26½	19⅝	26½
Western Elec.—7%		f 110⅜	110	117½
Worthington Pump & Mach.—A		79	79	88
Worthington Pump & Mach.—B		64⅜	64⅜	76½
COMMON STOCKS				
Allis-Chalmers Mfg.		f 88⅜	71½	88⅞
Amer. Bosch Magneto—no par		f 33½	26⅜	54½
Elec. Storage Battery—no par		f 64½	60¾	70⅝
General Elec.		f 327½	227¼	327½
General Elec.—10		f 11⅜	11	11⅝
aHurley Machine—no par		48	41⅛	56
Timken Roller Bearing		f 43	37⅜	46¼
bWagner Elec.		37½	26½	50
Westghse. Elec. & Mfg.—50		f 79¾	66¼	84
West. Elec. Instrument		f 20½	9¼	20½
Worthington Pump & Mach.		f 38	35¼	79¾
BONDS				
General Elec.	3½s 1942	87	83	87
	5s 1952	107⅛	101½	107⅛
Robbins & Myers	7s 1952	60	61½	73½
bWagner Elec. Mfg.	7s	100½	100	102
Western Elec.	5s 1944	100½	98	101
Westghse. Elec. & Mfg.	7s 1931	106½	103¾	108¼

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore. fBid price, low and high, Tuesday, Aug. 18. gLatest quotations available.